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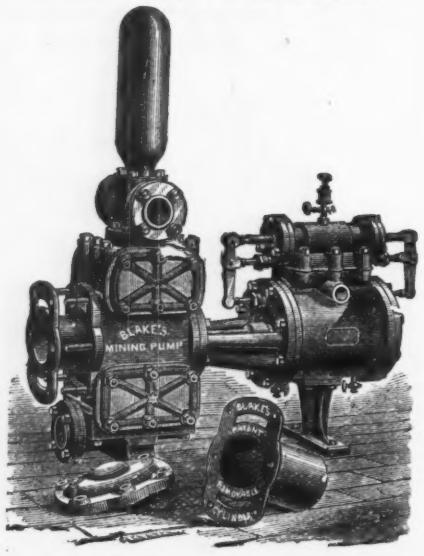

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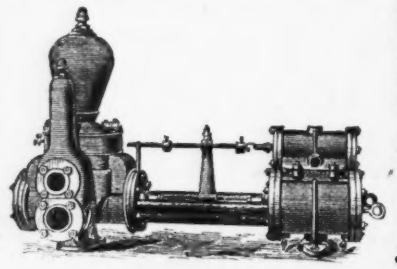

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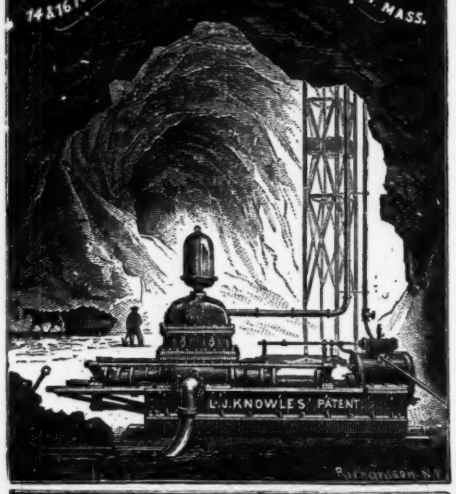

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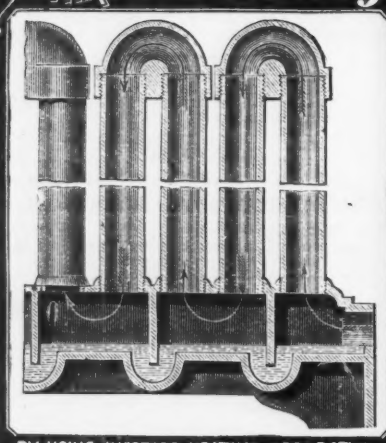

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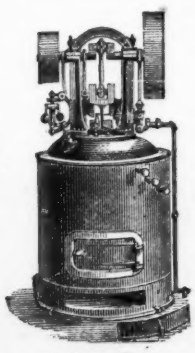

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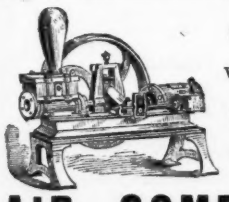

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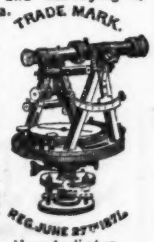

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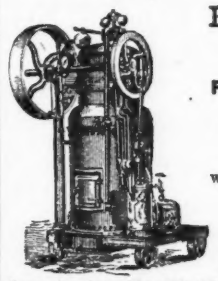

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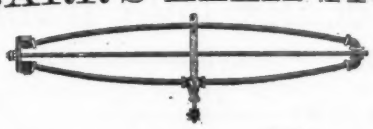

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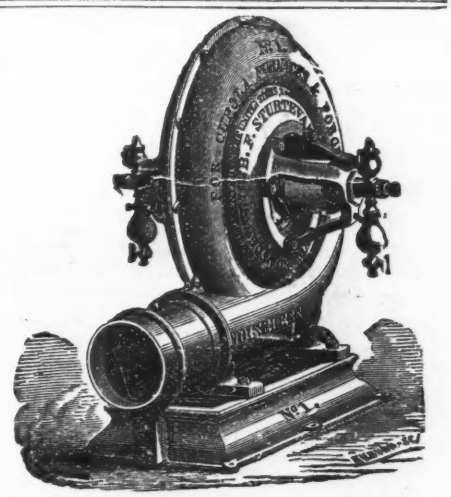

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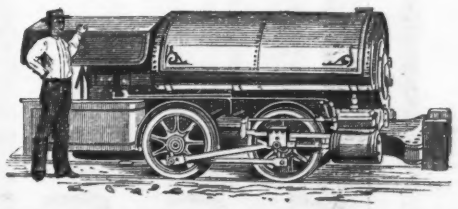

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THE ENGINEERING AND MINING JOURNAL.

RICHARD P. ROTHWELL, C. E., M. E.
ROSSITER W. RAYMOND, Ph. D. } Editors.

NOTE.—Communications relative to the editorial management should be addressed to Mr. ROTHWELL. The articles written by Mr. Raymond will be signed with a star.

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Fearful Explosion in an English Mine.

THE telegraph informs us that on the 6th inst. a fearful explosion occurred in the Swaithe Main Colliery in Yorkshire, by which 130 men lost their lives. The report significantly says that the mine is a fiery one, and has been worked with safety lamps exclusively, and it adds that the explosion was caused by blasting

Of course, this will be recorded as an *accident*, and yet it is thoroughly well-known that blasting should never be allowed in a mine which makes such quantities of fire damp as to require the general use of safety lamps. This question has already attracted the attention of the government in England, and there is a probability that, now, at least, after this fearful loss of life, the remedy will be applied that would have prevented it. There is another and simpler method of preventing such "accidents"—namely, the strict enforcement of a law that will prevent the working of any mine without ventilation sufficient to make every portion of the workings safe, without the use of safety lamps.

Good ventilation is a mere mechanical question, which consists in the adoption of powerful ventilating machinery and a skillful distribution of the air in the mines. There is no reason why any mine should be in such a condition as to require the general use of safety lamps, though it is possible that, in certain portions of the mine, they may be temporarily required. It is to an undue reliance on this very useful instrument that we must attribute many terrible explosions.

The Texas and Pacific Railway.

THE promoters of this road have long been working to influence public opinion in its favor, and secure Government assistance for the project. In these hard times, however, the people cannot forget the disgraceful raid made on the National Treasury in the interests of the Union Pacific by the Credit Mobilier, and the recent decision of the Supreme Court, which shows that the Government lien on the road, for some sixty or seventy million dollars, is practically valueless—notwithstanding all the fair promises made by its organizers and advocates when asking for "Government guarantees"—is a lesson that will, probably, long be remembered. It is, of course, needless to say that the Texas and Pacific disavows (as did the others at the corresponding period in their history,) all intention of defrauding the Government. On the contrary, the promoters of the T. and P. are virtuous, philanthropic gentlemen; they want the road built for the benefit of "present and future generations" in general, and of the Government in particular.

All that is asked is that the Government shall guarantee interest at 5 per cent. in gold, on an expenditure of about $40,000 a mile, in addition to its grant, already made, of 16,000,000 acres of land. The promoters show very conclusively that the road will earn much more than the interest on its bonds, and, that, not only the Government will never be called on to pay the amount it guarantees, but they prove, at the same time, that, if this be all that is to be claimed, there is no need whatever for the guarantee; and the enormous sums already spent, and now being spent to influence public opinion and legislation, are shameful wastes of money. Experience has taught us, however, to look with some suspicion on the philanthropy of the projectors of railroads, whatever their protestations may be, and when we find them expending large amounts of money to secure a Government endorsement, which they show to be nothing more than a mere form to give confidence to foreign capitalists, we naturally look for the reasons that are kept in the background. With the particular case of the Texas and Pacific Railroad we are not sufficiently well acquainted to designate the real cause of this solicitude for Government endorsement, but we are very certain that the country is in no condition to-day to lend its credit to float gigantic private undertakings; nor can the people afford to be taxed three or four million dollars a year, if it be no worse—to support even this desirable road.

In a pamphlet recently issued by the projectors of the Texas and Pacific road, there are given extracts, showing the endorsement of the project by a large number of, more or less, influential papers. Among others, is one referring to the copper deposits on the line of the road, which is credited to the ENGINEERING AND MINING JOURNAL. No such article ever appeared editorially in this paper, and we protest against being made responsible for the assertions there made, and against this use of our name. There are, undoubtedly, very rich copper deposits in New Mexico, and the building of the Texas and Pacific road will do much toward making them available.

Common report credits some of the chief promoters of the Texas and Pacific Railroad with holding very large interests in these mineral lands, the value of which would be enormously increased by the building of the road. It is easy to see how a few enterprising patriots could thus turn an honest million or so out of the scheme, to say nothing of the profits in handling the bonds, supplies, etc., etc.

The claim for support, made on the ground of the great demand the building of the road would bring for iron, is of little importance; it would, probably, not exceed a few per cent. of our present consumption for each year that the road was being built, and its effect on our iron markets would be wholly inappreciable. The iron trade has more to gain by strict economy in our national expenditures, and the re-establishment of that commercial prosperity which has been so seriously interrupted, to a great degree, by the policy of locking up our capital in unproductive railroads, than it possibly can have in opening a market for less than a hundred thousand tons of iron a year. The road is certainly desirable, but not at the present time, on the terms proposed, and the fine assurances of reduced freights, to come from active competition with the present Pacific road. are not in such a form as to insure their fulfilment. Every one knows how Colonel SCOT has managed to effect combinations to keep up freights, when the interests were much more difficult to harmonize than would be those of the two Pacific roads.

The Effect of the Duty on Copper.

OUR enterprising contemporary, the *Northwestern Mining Journal*, thinks that the repeal of the duty on copper would close all the mines on Lake Superior, except the Calumet and Hecla, and would, consequently, make the monopoly now enjoyed by that great corporation, more complete than it is. We do not agree with the views here expressed:

"Let us see what would be the effect of the programme advocated by the ENGINEERING AND MINING JOURNAL, on the only mines that would stand the least chance of surviving, if the tariff were removed. One will serve as an illustration. Take the Quincy, which, next to the Calumet and Hecla, is the most profitable copper mine in the United States. In 1847 her product was 3,046,698 lb. of ingot, at a cost of 15 13-100 cts. per pound, marketed. The average sales of the year were 21 88-100 cts. per pound. Had there been no 5 cent duty, the sales, according to the argument of the free-trade journals, would have averaged only 16 88-100 cts., and the net profits on the year's business would have been $52,317. Does the Editor of the ENGINEERING AND MINING JOURNAL suppose that a mine, whose market value represents about $850,000 would be kept at work for profits that would not amount to 7 per cent. interest on the capital invested. We should suppose capital would seek less precarious channels of investment—channels which would yield larger and surer profits. We have no hesitation in declaring our belief that such would be the case, and that in less than a year after the abolition of the tariff, not a copper mine, save the Calumet and Hecla, would be at work on Lake Superior. But if the reasoning of the ENGINEERING AND MINING JOURNAL, in the 3d and 4th paragraphs of its article, are sound, why remove the tariff at all? What good will it do? If, after the 'unprofitable mines' were closed up, the 'the production even then exceeded the consumption, and no foreign copper would come in,' how would consumers be benefited by the removal of the duty? The power of the only company able to carry on the business, in such a contingency—the Calumet and Hecla—would simply be increased—erected into a complete monopoly. It is well known that this mine could easily double its product (if its managers so chose) and put the price down so low that foreign dealers would find competition impossible, even if, as argued by the ENGINEERING AND MINING JOURNAL, the excess of production above demand did not operate to exclude foreign copper from American ports. This power it has not used hitherto, preferring to sell its surplus product to old world purchasers, and give its sister mines in the copper region a chance to live. If a combination is able to keep the price of copper up whilst there is still some competition left, how much better able would a single company be when competitors were driven from the field?"

It must be very evident that, though no foreign copper would come in, were the duty repealed, it would be because our producers can afford to sell for less than foreign copper would cost, and prices would undoubtedly decline to a point a little below that figure. If the supposition were true, that prices would be maintained, of course none of the mines now working would stop. The cost of ingot copper per lb. marketed, to the Quincy and Central Companies, was, in 1874, respectively, 15.13 cts., and 16.20 cts., as given in the reports of those companies. (see ENGINEERING AND MINING JOURNAL, May 29th, 1875,) The general contraction in expenses in every department of industry during the past year, has doubtless been exercised by these companies also, and they could still make handsome dividends were the price of copper reduced three or four cents per lb. The admission that the Calumet and Hecla can double its production, or alone supply the demand of the country, at figures that defy competition, is the strongest possible argument for the repeal of a duty that goes to "make the rich richer, and the poor poorer," and that is doing an injury to those of our manufacturing industries that use copper.

It is undoubtedly true that some of the Lake Superior mines are so poor in the quantity and value of their ores, that they never can pay, but a larger number have been unsuccessful more on account of extravagant, and, sometimes, dishonest management, than from this cause. Possibly the prospect of lower prices for copper would tend to stimulate economy, and secure that better management which is yet sadly needed in some cases.

In the following table, taken from the *Northwestern Mining Journal*, will be found much information interesting in this connection:

No. of Shares.	LAKE SUPERIOR COPPER MINING COMPANIES.	Assessments.	Assess. per Share.	Total Dividends paid.	Divids. per Share.	Last Dividend, when Declared.	Amount in Treasury.
80,000	Calumet & Hecla...	$ 800,000	$10 00	$9,040,000	$113 00	$5, Aug. 15, 1875.	$1,000,000
20,000	Pittsb'gh & Boston,	110,000	5 00	2,280,000	114 00	.....	.....
20,000	Minnesota	440,000	22 00	1,750,000	87 50	$2, Feb., 1872.	20,000
20,000	Quincy.....	200,000	10 00	1,890,000	94 50	3, Aug. 15, 1875.	328,000
20,000	Central	100,000	5 00	920,000	46 00	4, Feb., 1875.	140,000
20,000	Pewabic	240,000	12 00	400,000	20 00	2, March 15, '72.	25,000
20,000	National	150,000	7 50	300,000	15 00	1, Feb., 1872.	40,000
20,000	Franklin.....	380,000	19 00	240,000	12 00	1, Feb., 1872.	10,000
20,000	Ridge	200,000	10 00	150,000	7 50	1, Feb., 1875.	60,000
20,000	Copper Falls.....	100,000	25 00	100,000	5 00	Aug. 21, 1871.	45,000
20,000	Houghton.....	1,050,000	52 50	Non-Dividend.			
20,000	Isle Royale.....	1,010,000	50 50				
40,000	Atlantic.....	1,040,000	26 00				
20,000	Phœnix.....	830,000	41 50				
20,000	Allouez.....	800,000	40 00				
20,000	Schoolcraft.....	420,000	21 00				
20,000	Delaware.....	450,000	22 50				
20,000	Hancock.....	500,000	25 00				
20,000	Mesnard	160,000	8 00				
20,000	Amygdoloid.....	500,000	25 00				

NEW PUBLICATIONS.

THE GOLD FIELDS OF YESSO. *A Report by* HENRY S. MONROE, E.M., *Professor of Geology and Mining in the Imperial College, Tokio, and formerly Assistant Engineer to the Kaitakushi of Hokkaido.* Tokio: Published by the Kaitakushi. 1875.

THE Japanese are by no means yet emancipated from the bondage of tradition, conservatism and jealous nativism. The progressive party of the Empire seems just strong enough to originate ambitious plans of improvement, while the party of inertia and reaction is strong enough to prevent any thorough or fruitful execution of such plans. Numerous American scientists, from the days of PUMPELLY and BLAKE to the present time, have been engaged by the government, and high salaries and much polite attention have been paid to them, but they have not been allowed to carry out any important measures for the development of the country. Even the project of a geological survey or a reconnoissance of the mineral resources of Japan has practically failed, thus far, on account of the intense reluctance of the Japanese to permit the access of foreigners to the interior of their country. A certain part of the island of Yesso appears to form an exception to this rule, and to have been set apart for the amusement of distinguished American explorers. BLAKE, ANTISELL, LYMAN and MUNROE, in succession, have been kindly let loose upon Yesso, and carefully hindered from explorations elsewhere. Unfortunately, the mineral resources of Yesso appear to be few, small and uninteresting; and we fancy it must be a bore to active minds to be required, at whatever salary, to traverse forever that well-worn and poverty-stricken field.

Professor MUNROE, apparently nerving himself to discharge his monotonous duty with fidelity, and resolving to do it, if possible, in a way so thoroughly conclusive as to preserve future American engineers from the doom of repeating it, has furnished, in the pamphlet before us, an account of the extent and value of the gold fields of Yesso. This report was forwarded by him to MR. BENJAMIN S. LYMAN, Chief Geologist and Mining Engineer to the Kaitakushi of Hokkaido, and constitutes a part of the survey conducted by Mr. LYMAN. It includes also the results of the examination of numerous "so-called copper, lead and silver mines, visited incidentally while traveling from one gold field to another." As may be inferred from the phrase just quoted, the latter mines were found to be worthless. The gold fields likewise were shown by laborious demonstration to be shallow and poor. Professor MUNROE's careful tests and surveys may be summed up in the following tabular statement, which we have condensed from the pages before us, for the convenience of our readers, reducing the depths and areas approximately from meters to yards, assuming the meter as 1.1 yard and the square meter as 1.2 yard:

Gold Field.	District.	Area in sq. yards.	Average depth of gravel in yds.	Av'rage value per cub. yd. in cents.
Toshibetsu.....	Upper Valley.....	960,000	3.30	5 60
"	Remainder.....	5,114,000	3.30	3.60
Kudo	Moshibetsu.....	345,600	1.65	0.30
"	Usubetsu.....	1,488,000	1.65	0.05
Esashi	Imikishi	693,600	1.98	0.20 to 1.00
"	Otobe, etc.	not given		0.01 to 0.09
Matsumai	Matsumai	exhausted		
Musa	Yunoshiri	1,200	2.00	6.61
"	Remainder	3 831,400	2.64	0.70
Tokachi.....	Ayoboshuma.	not given	7.00	0.01
"	Sundry places.....	" "	10. to 15.	nil.

The value of the gravel in most of these localities is too small to pay for working it, even at Japanese rates of wages. Even the two small areas which show over five cents per cubic yard would not be considersd inviting by American capitalists. On the whole, it must be confessed, the gold fields of Yesso amount to very little.

Professor MUNROE gives an interesting account of the Japanese method of gold-washing, which he says is far more efficient in saving fine gold than the cradle or "long tom," and which he consequently adopted for testing the auriferous gravel. His tests ranged from one-fourth of a cubic yard to two or three cubic yards each (and we are probably safe in saying that a cubic yard of the gravel would weigh about a ton). We condense his description of the method:

A washing ditch, two or three feet wide and twenty long, is formed by clearing out the bed of a small stream or walling off a portion of a bed of a larger stream. Riffles of flat stones are placed at its lower end. The gravel is shoveled into the head of this ditch, and the workmen throw it out by hand or with the aid of the hoe and the *kua*, a scoop-shaped bamboo basket. The clay and finest sand are washed away by the current, leaving in the stream the fine gravel and gold. When this deposit has become about one foot thick, the washing begins, on straw mats specially woven for this business, which seem to serve the same purpose as the hides of the Mexican gold washer, or the coarse blankets manufactured for stamp-mills, tailing-sluices, etc., on the Pacific coast. The manner of their use is peculiar. Professor MUNROE says:

Two or three mats, each one foot wide by two feet long, slightly narrower at the lower end, are placed side by side across the stream, about two feet below the upper end of the gravel. The upper edges of these mats are buried slightly in the gravel, and held in position by the foot of the gold-washer, usually one man to each mat, the number of mats being regulated by the width of the stream. These men now carefully hoe the gravel to the head of the mats, so that it shall be carried on their surface by the force of the current. The heavy gold and iron-sand sink between the thick twisted strands of straw forming the mat, while the lighter gravel passes down stream. The lower ends of the mats are from time to time lifted, and folded over the upper portion, to transfer the gold to the head of the mat, and to keep the lower part clean.

When all the gravel in front of the mats has been hoed over their surface, the men move them about two feet down stream, and begin to work in a similar manner, on the new portion of gravel thus exposed. Finally, after twenty-five to thirty minutes work, the mats are removed, one by one, from the bottom of the stream; folded in both directions under water, to transfer the material to the middle; and then bent in a trough-like form, and "jigged" with a longitudinal motion, under the water, to separate the lighter sand and gravel which still remains. One of the mats is then held in the stream, between the ankles of the gold-washer; folded lengthwise as a trough, through which the water is allowed to flow quietly. A second mat is then seized by the ends, inverted, and folded transversely, the fold being allowed to dip just below the water in the trough of the mat below. The mats are so woven that this folding opens the crevices between the large transverse strands, allowing the gold and iron-sand to be washed out by the water. By alternately raising each end of the mat, while depressing the other, the whole surface is successively washed by the stream; and the various strands of the mat being opened, and loosened, by the folding, the gold and iron-sand are very completely transferred to the lower mat. In a similar way, the concentrated material from all the mats is collected on one; and from this is finally transferred to the shallow wooden washing board. This last transfer is made with great care, in a quiet pool of water; in which place the final concentration, on the board, is effected. The separation of the gold from the iron-sand, on this board, requires great care and skill. The board is first floated on the water, and by a few oscillating motions, the material is washed to the center. Then it is raised from the water, with a number of smart longitudinal jerks, the effect of which is to bring the heavier material to the end next the gold-washer, while the lighter sand flows off gradually with the water at the lower end. The board is now brought to the surface of the water, the lower end dipping a little below, and with one or two gentle swings it is again covered with water, while a small quantity of light sand is washed from the lower end. The board is now raised, with the same dextrous shakes as before, the washing being conducted with great care and but little iron-sand being allowed to pass off each time. After five or six minutes, most of the gold will have been brought to the head of the board, the bright yellow grains showing very distinctly in the black sand. The gold may be brought more clearly into view, by allowing a little water to trickle down the inclined board, which washes off the black sand, and leaves the gold exposed.

This first portion of gold, with some of the adjoining iron-sand, being removed, the remaining sand is then washed a few times, usually yielding one or two grains in addition.

Finally, the gold and the small quantity of iron-sand taken from the board at the same time, having been dried, are submitted to a careful separation by blowing; the iron-sand is carried off, and the gold remains, ready for weighing. In this last separation, a small magnet is sometimes of assistance, in removing large grains of iron sand, too heavy to be blown away.

The manipulation of the *ita* or warped board described in the above paragraph is closely similar to that of the wooden *batea* of the Mexicans—the forerunner of the California iron pan. The *batea* is like the wooden vessel in which many New England housekeepers are at this moment chopping the materials for Thanksgiving mince pies. It contains considerably more material than the ordinary Russia-iron prospecting pan, and may perhaps work faster; but in spite of the talk in its favor which we hear now and then from those who have been bewitched by the dexterity of the Mexican, it is inferior to the pan for saving fine gold. Nor can it be so easily cleaned of grease or quicksilver—an operation which, in the case of the pan, is quickly performed by simple heating. We presume these remarks are equally applicable to the Japanese *ita*. As to the *nekoza* or straw mat, we doubt its superiority to hides or blankets. The Japanese system, as a whole, appears to be a capital one for prospecting. In continuous operations, sluices, riffles and quicksilver would doubtless be as efficient and much cheaper and more rapid. *

Delivery of Coal in Cities.—A correspondent in the New York *Times* makes the following pertinent remarks on the delivery of coal:

"I think every resident of this city must have experienced annoyance at observing the manner in which coal and other fuel is delivered at private houses. The cart is backed up to the sidewalk, and its contents shot partly into the street and partly into the gutter, and the remainder over the sidewalk, where it is left, sometimes for hours, until some one can find leisure to put it in, and in the mean time pedestrians have to leap or climb over the heap of black diamonds, a considerable portion of which is ground into dust beneath their feet. We might surely take a lesson from our London cousins here. In that city the sidewalks are believed to be for the exclusive use of pedestrians. No one is allowed to make coal-yards of them, neither can they be used for the storage of dry-goods boxes or for the practice of base-ball. The dealer is compelled to deliver his coal in sacks, each containing so many pounds, and to weigh them in his customer's presence when desired. The contents of each sack can be carried at once into the back-yard or up stairs, or shot into the vault, as the case may be, without a single particle of dust escaping. A couple of men, as I have frequently seen, can dispose of five tons of coal (fifty sacks) in half as many minutes, without blockading the sidewalk a moment or leaving an atom of dust behind them. Now, why cannot this be done here? Surely our City Fathers, for with them I believe the matter rests, would do well to consider it, and some of our coal dealers might, I think, find it advantageous to introduce the practice."

Investigations of Iron and Steel Rails made in Europe in the Year 1873.*

BY T. EGLESTON.

CONTINUED FROM PAGE 552.

The same results are shown by the statistics which were collected for me by the Orleans Co. for the years 1864 to 1872, which show as to the mean of all the years, that the greatest number of rails broken was in January, and that about the same number were broken in the months of February and December, March and November, and April and October. It then seems to increase in May, to diminish in June, to increase in July, then suddenly to fall in August, to gradually increase again to its maximum in January.

Iron rails broken, per month, on the principal roads on the lines of the Orleans Company of France during the years 1864 to 1872 :

Years	Lengths of the principal lines. Km.	No. of rails broken during the months of												Total.	Proportion of rails broken to the 100 kilometers.
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		
1864	3,343	113	94	72	61	58	45	45	50	53	54	98	77	820	21.3
1865	4,016	123	116	111	79	49	42	24	33	25	60	83	99	844	21.0
1866	4,265	110	86	91	74	66	52	51	30	48	95	101	125	949	22.2
1867	4,538	151	109	111	102	80	77	60	63	59	88	84	121	1,105	24.3
1868	4,796	153	126	126	96	57	35	38	56	45	62	78	98	971	20.2
1869	5,018	105	97	101	80	65	55	50	41	54	77	98	127	949	18.9
1870	5,241	123	132	96	72	62	32	37	34	35	69	130	104	926	17.6
1871	5,297	226	128	145	92	52	83	54	61	73	139	176	161	1,390	26.2
1872	5,380	248	169	166	102	91	61	46	48	47	88	127	140	1,333	24.7
Mean.	4,710	150	118	113	84	65	54	45	48	49	81	108	117	1,032	21.9

The following statistics were collected, at my request, with reference to two double-headed iron rails, No. 1 and No. 2, which were broken on the Lyons RR., sections of which were prepared for etching and were to have been examined. They are exceedingly interesting as No. 1 shows an unusual life, though not so great as the life of some of the Belgian rails cited further on. The tonnage passed over it, however, was not equal to that required by the Northern RR. for the best iron rails. No. 2 did not last so long as No. 1, but still much longer than the ordinary iron rail. The amount of tonnage which passed over it is very small. Rail No. 1 was 13 cm. high, 6 cm. in its widest part, and 20 mm. in the body of the rail. It weighed 37.50 k. per m. It was made at St. Jacks, Montluçon, was laid in December, 1862, and was broken January 12, 1874. It was therefore 11 years and some days old. It was placed upon a straight line with an incline of 0,004.

The total amount of tonnage which passed over it, was 16,761,677 tons, as is shown year by year in the following table :

RAIL NO. 1.

Year.	Tons.	Year.	Tons.
1863	1,515,680	1869	1,665,155
1864	1,418,820	1870	768,658
1865	1,357,650	1871	1,767,651
1866	1,368,210	1872	1,856,831
1867	1,436,785	1873	1,952,948
1868	1,547,673	1874	0,125,676
	8,644,818	Total	16,761,677

Rail No. 2 was 13.24 cm. high, 6 cm. in its widest part, and 18 mm. in the body of the rail, and weighed 36 k. the metre. It was made at Fouchanbault, in March, 1868, and broken in July, 1873, after having been five years and two months in use. It was on a straight line with an incline 0,003, and the total tonnage which passed over it was 2,647,433 tons, as is shown year by year in the following table :

RAIL NO. 2.

Year.	Tons.	Year.	Tons.
1868	338,407	1872	480,583
1869	531,952	1873	262,695
1870	527,050		
1871	506,746	Total	2,647,433

I was particuly struck, in France, with the importance attached to having no repairs of any kind done to the rails by the manufacturer. The conditions of the contract are such that it is contrary to his interest to make them, or to attempt to conceal in any way any defects. I had seen so much of this kind of repair done in Germany and elsewhere, but particularly in Germany, that this condition attracted my special attention. In one of the German works, the engineer who accompanied me, pointed out with special pride the skill with which they were able to putty up defects, and stated to me that the composition and method of doing it was a secret, and that only special workmen could do it. The defects were certainly thoroughly concealed, and it required very close inspection to discover cracks which had been cut out with a hammer and chisel, or with a file, and filled up with the composition, and there was very little probability that they would be discovered, even if they were sought for in the inspection. But it is very much like trying to cure the symptoms without attacking the disease. In other works, both in this country and in Europe, no attempt whatever is made to conceal, nor apparently to prevent, these defects, and I have seen very large piles of rails ready for delivery, not a single one of which, so far as I could discover, was without what appeared to me to be serious defects in the flange. These rails were besides cut, punched, and nicked, cold. I do not know where they were laid, but I was quite prepared to hear from a large railway house that the life of certain rails, which were laid on an ordinary road-bed without accidents or unusual wear, did not exceed 18 months.

Almost all the companies in Europe have rail repair shops for iron rails, and very ingenious machinery which is usually copied from American works, and often conducted by Americans. In these works, defective rails removed from the road bed, are repaired. It is evident that the companies have a great advantage in doing this, since in most cases rails which are only damaged, remain the property of the company, but must be paid for by the manufacturer, under the stipulations agreed upon in the contract. These repairs usually consist in putting in pieces, to fill out the rail where it has been damaged. In most cases these pieces are put into the head at the ends of the rail, but they occasionally require to be put in the head in the middle of the rail, and occasionally any other parts are replaced in the same way.

*A paper read at the St. Louis meeting of the American Institute of Mining Engineers, May, 1874.

The furnaces used for doing this work are so constructed that the rail may be heated in any part independently of the other. The pieces to be put in are adjusted to the rail, which is then heated at that point, and passed through rolls so adjusted, that they may bear only on the point heated. This requires very great skill in the workmen, much more skill than time. When the ends are pieced, the pile is arranged in such a way as to make the rail too long, and it is afterwards cut to length, in order to have a perfect end. When the rails are not badly damaged, and are properly repaired, they look well, and can be very profitably used on turnouts or any other part of the road where they are not exposed to very great wear. Steel rails are never repaired, for the only accidents that ever happens to them is breakage, and then they are replaced by the manufacturer.

The Central RR. of Belgium is 591 km. in length, and uses six different kinds of rails whose weight, and the number of kilometers used in each, is given in the table below.

Kind of rail.	Weight per metre.	Lengths laid down in kilometres.
Double headed with each head alike....	37	18
" " " " " "	33	153
" " " heads of different size	34	89
American rail.....	37	252
" "	35	76
" "	17	3

Besides this there are 141 kilometers, not included in the above, on side tracks and switches. It is found every year, as will be seen by the table, that the quality, or rather the power of resistance of iron rails decreases, which may be due in part to increase in traffic. On this road the iron rails are usually guaranteed for three years. There were, consequently, in 1870, the rails furnished by the contracts of 1867-68-69 to be examined. The following table gives the result of this examination of the rails, made for the year 1870 :

Year the rail was finished.	Years of wear.	Rails rejected on Contract No. 1.	Rails rejected on Contract No. 2.	Rails rejected on contract No. 3.	Mean for the year.
1867.	3	*10.63 per cent	*31.22 per cent		13.89 per cent.
1868.	2	†31.26 " "	*42.28 " "		34.39 " "
1869.	1	2.76 " "	*3.33 " "	‡ 0.89	2.88 " "

* Hammered. † Rolled. ‡ Steel.

The contract No. 3, for the year 1869, was for Bessemer steel rails which are guaranteed for 7 years, and had six years yet to run. It shows an exceedingly small proportion of rejected rails. The contracts No. 1 and 2, for all the years, were for iron rails. The guarantee for iron rails is for three years, but in order to ascertain exactly how the rails wear out, the revision is made every year, and kept up each year after the term of guarantee expires. The following table gives the results of the revision of iron rails made in 1870, for each year from 1865 to 1869 :

Situation of Iron rails, guaranteed for three years, on the Grand Central Railway of Belgium, in the year 1870.

Year the rail was laid.	No. of years of service.	Percentage of rails taken up.	Percentage of rails damaged.	Total percentage of rails taken up or damaged.	Per centage of good rails remaining upon the road.
1865.	5	58.92	18.62	77.54	22.46
1866.	4	43.99	20.79	64.78	35.22
1867.	3	2.55	11.34	13.87	86.11
1868.	2	6.15	28.24	34.39	65.61
1869.	1	0.29	2.59	2.88	97.12

Comparing these figures with those found as a result of the revision of 1869, the following result was found for the year 1869 :

Situation of Iron Rails Guaranteed for three years on the Grand Central Railway of Belgium in the year 1869.

Year the rail was laid.	No. of years of service.	Percentage of rails taken up.	Percentage of rails damaged.	Total percentage of rails taken up or damaged.	Percentage of good rails remaining upon the road.
1865.	6	17.77	8.25	25 52	74.48
1866.	5	36.20	6.66	42.86	57.14
1867.	4	1.88	8.61	10.49	89.51
1868.	3	5.00	17.5	22.58	77.42

The revision of the rails laid down in 1867, at the expiration of the three years' guarantee, gave very different results for the two works which furnished the iron rails as is seen by the table. The one giving a loss of 31.22 per cent., and the others a loss of 10.63 per cent. The first of these are rails which were rolled, while the others were hammered. Of the 10.63 per cent rejected of the hammered rails, there were only 1.37 per cent. which required to be removed from the road bed. The other 9.26 per cent., although rejected, did not need to be taken up. They can still be used for a long time on the road. The greatest confidence in these hammered iron rails is expressed by the Belgian engineers, as being far superior to any of those which are rolled.

Of those which were laid upon metallic ties, at the end of three years' service, there were only 2.49 per cent. rejected, and not a single one of these was taken off the road. Of those which were laid upon ordinary ties of wood, there were 12.44 per cent. rejected, of which 1.76 per cent. had to be taken off the road altogether. As these rails are placed in positions which are identical, and were made by the same works, the difference in wear can only be attributed to the greater stability of the road bed due to the use of metallic ties.

The results of the examination of the rails laid in 1868, after being down two years, are very bad, but this was expected as they showed very bad wear, often after one year's use, resulting from very defective manufacture. This defect having been remedied, the hammered rails for 1869 showed only 2.76 per cent. and 3.33 per cent. rejected, or for the year only 3 per cent.; of which only 0.30 per cent. were removed from the road bed. Whatever may be said in favor of these hammered rails, they are not to be compared with Bessemer steel rails, which after one year of use showed only 0.89 per cent. of rejected rails,

not one of which had to be taken up. It will also be seen by the tables, that the number of rails taken up relatively to those which are damaged, increases very rapidly from year to year. Thus after one year, about 10 per cent. of the damaged rails were taken up. After two years, 18 per cent, after 3 years, 18 per cent., after 4 years, 19 per cent., and after 5 years, 79 per cent. of the rails remaining on the road. It will be seen by these tables, that there remained upon the road bed, in 1870, only 22 to 35 per cent. of the rails laid down in 1865 and 6, that is to say, that the life of these iron rails was only 4 or 5 years. These facts, taken in connection with the results shown in all the comparative tests between iron and steel rails, seem to show that it is extravagant to use iron rails under any conditions.

The Belgian engineers speak in the highest terms of metallic ties, and were making a great many experiments upon the subject, the results of which have not reached me. They were tried extensively in Germany, and I was informed by the engineers at KRUPP's works that they had definitely abandoned the use of wooden ties. I noticed, in 1873, that some of the German roads near the French frontier, which had commenced to use them, had taken them up, but I could not ascertain the cause. I am indebted to Mr. G. SCHORN, Government Engineer of Mines at Liege, Belgium, for the following statistics with regard to the life of iron rails on the State railways of Belgium, for the year 1869. These statistics are particularly interesting, since they give not only the life of the rails but the total amount of passenger and freight traffic over the road for the year. It is, however, always a vicious practice, to give the life of a rail in years, for this does not necessarily signify anything, for it is evident that a rail may be laid in some part of the road, where there is not much traffic, and consequently may last indefinitely. The only proper way to express the life of a rail, is by the number of tons traffic which has passed over it. The rails which are used on the State railways of Belgium are of five kinds, two kinds of **T** rails, two kinds of double-headed rails, and the ordinary American rail. The **T** rails are of iron, and have the stem below the head, either undulated or straight, and are laid in cast iron chairs. These **T** rails were the first kind of rails ever manufactured, and as they were made at a time, when cheap rails were not so much sought for as now, it is not at all surprising to see that they have a life which no rail made in modern times has ever yet attained, though it is quite probable that the steel rails will outlast them. Such rails as these were formerly used in this country, and have given results quite similar to these which are given abroad.

The double-headed rails are either symmetrical, or not symmetrical. The fifth kind of rail is of the ordinary American pattern, which they had commenced to use eight years previous to this time. These rails are laid upon ties which are 0.90m. apart, that is to say, there are 1760 ties for an English mile, instead of 2640 ties, as is commonly the case in the United States.

The following table gives the weight, per metre, of these different rails :

Weight, per metre, of the different rails used on the State railways of Belgium, in 1869.

	Kil.
T rails with a curved stem	19 to 22
T rails with a straight stem	25 to 27
Double-headed rails with symmetrical heads	38½
Double-headed rails with dissimilar heads	34
Ordinary American rail	37

The following table gives the number of passengers, first, second and third class, carried by express, ordinary and special trains over the road, showing a total traffic, over a road 863km. in length, of 13½ millions of passengers :

Passenger traffic on the State Railways of Belgium for the year 1869. Total length of the road, 862,666 km.

No. of passengers carried during the year.

By Express trains,	1st class	383,749	
	2d class	353,841	1,407,881
	3d class	670,291	
By Ordinary trains,	1st class	554,681	
	2d class	1,564,238	11,803,682
	3d class	9 684,759	
By Special trains,	Children	135,495	
	Soldiers	109,593	365,453
	Civilians	120,365	
			13,577,016

The following table gives the total quantity of freight carried over the same road, for the same year :

Quantity of freight carried during the year 1869 on the State Railways of Belgium.

Smallest quantity sent at any one time	103,172
1st class	382,790 tons
2d "	414,280 "
3d "	546,296 "
4th "	1,724,911 "
Special freight	780,037 "
Freight transported at a reduced price	95,103 "
Freight by contract	78,000 "
Totals	4,021,417 tons.

The following table shows the entire distance, in kilometres, which every kind of train has traversed :

Distance traversed by every class of trains during the year 1869, on the State Railways of Belgium.

Passenger trains,	Ordinary	3,880,866 km.	
	Express	1,145,010	5,069,001
	Special	43,125	
Freight trains,	Special	295,946	
	Ordinary	4,274,080	4,569 976
To'al			9,638,977

The following table gives the number of kilometres of traffic, which the rails, taken up from the road, supported. It is very interesting to notice, in this table, that the service of the rail gradually increases up to 13 years, and then gradually diminishes, until it amounts to almost nothing ; but even this life of 13 years is most extraordinary for an iron rail, even, though the amount of service, during this time, should not have been so very high. The number of tons carried over each rail is wanting. It is, however, necessary for the proper interpretation of the table, although, supposing the service of the rails to have been the same in all cases, as it undoubtedly was, a relative view of the life of the rails is shown in it :

Wear of Rails taken up from the State Railways of Belgium in 1869.

No. of years of service.	Length of rails in metres.	No. of years of service.	Length of rails in metres.
½	1,363	16	233,937
1	4,417	17	299 185
2	11,128	18	205,542
3	9,703	19	144,302
4	29,397	20	75 007
5	67,803	21	40.454
6	125,278	22	17,668
7	95,051	23	23,432
8	120,999	24	21,050
9	143,272	25	8,697
10	171,638	26	5,709
11	354,804	27	3,384
12	403,159	28	3,653
13	496,419	29	1,401
14	417,292	30	919
15	333,261	31	1.194
Total			3,870,518

On the Substitution of Liquid, Vaporized and Gaseous Hydrocarbons for Solid Fuel in Blast-furnaces.

By CHARLES PLAGGE.

THE almost inexhaustible supplies of Petroleum and natural gas which can now be obtained in many sections of the North-western States, make it desirable to find new and more extended uses for them ; and the question arises, how can they be made available for the manufacture of iron? To answer this question, we have to ascertain not only its siderurgic value, as a combustible and reducer, but also the influence which its substitution for solid fuel will have on the quality of the iron produced. Its siderurgic value depends largely upon its constituent parts and varies with these ; this variation, however, in a purely siderurgic point of view, is much less considerable than when considered chemically, as there is but a comparatively slight difference in the heat value of the various petroleums, although on account of a different combination of its hydrogen and carbon, their value as an illuminant, or lubricating material, may be very great.

According to Prof. H. WURTZ' analysis (see ENGINEERING AND MINING JOURNAL, August, 1875, p. 122), the commercial crude petroleum may be considered as consisting of :

84 per cent. Carbon,
14 " " Hydrogen,
2 " " Oxygen,

100 lb. Petroleum.

Or, assuming the 2 Oxygen to be combined with 0.25 H., it will contain :

84 per cent. Carbon,
13.75 " " Hydrogen,
2.25 " " Water.

Supposing the petroleum is but incompletely burned, in such a way that its carbon is only converted into carbonic oxide, its hydrogen into water, its siderurgic value will be as follows :

The 84 lb. of carbon to be converted into carbonic oxide, require 75 : 100 = 84 : x = 112 lb. oxygen, or 423 lb. atmospheric air. The products of combustion will consist of :

196 lb. carbonic oxide,
126 " water,
631.75 " nitrogen.

[NOTE.—In the following, CU°. will represent *caloric units centigrade.*]

84 lb. carbon burned to carbonic oxide generate 84 × 2,221 = 186,564 CU°.
13.75 " hydrogen " " water " 13.75 × 34,444 = 473,605 "

Total heat generated by 100 lb. petroleum = 660,169 "
Deducting the latent heat of the 126 lb. of water, equal to 126 × 537 = 67,662 "
we obtain, as heat value of 100 lb. of petroleum, incompletely burned = 592,507 "

The temperature obtained by the incomplete combustion of petroleum, we find by the equation $592{,}507 = [196 \times 0.288 + 126 \times 0.847 + 631 \times 0.275]x$

or, $x = \frac{592{,}507}{336} = 1{,}763°$ C.

A very different result we obtain by the *complete* combustion of petroleum, by which its carbon is converted into carbonic acid, its hydrogen into water. In that case we find :

84 lb. carbon burned to carbonic acid require 224 lb. oxygen, or 861 lb. of atmospheric air.
13.75 " hydrogen, as stated before, require 110 lb. oxygen, or 423 lb. of air.

The products of combustion are :

308 lb. carbonic acid,
126 " water,
950 " nitrogen.

The heat generated by burning 84 lb. carbon to carbonic acid is 84 × 7,900 = 663,600 CU°.
The heat generated by burning 13.75 lb. hydrogen to water is (as before) 473,605 "

Total 1,137,205 "
Deducting, as before, the latent heat of the 126 lb. of water, 67,662 "
we obtain, as total available heat from the complete combustion of 100 lb. petroleum = 1,069,543 "

The temperature thereby obtained is expressed by equation :

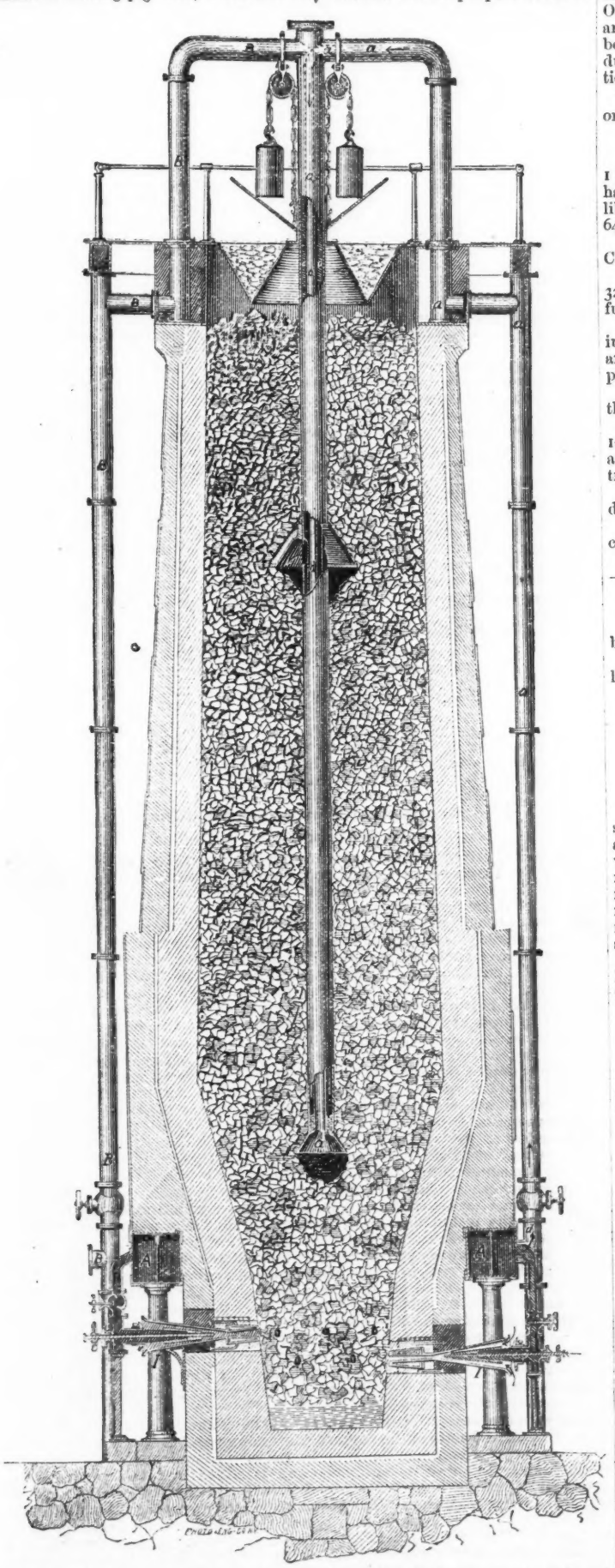
$1{,}069{,}543 = [308 \times 0.212 + 126 \times 0.847 + 950 \times 0.275]x$

$x = \frac{1{,}069{,}543}{433} = 2{,}470°$ C.

100 lb. of petroleum, therefore, when burned to carbonic acid and water,

produces not only 1,069,543—592,507=477,036 CUc. more heat, but also a temperature of 2,470—1,763=707° C. higher, than when burned merely to carbonic oxide and water.

While, therefore, petroleum, when incompletely burned, is scarcely serviceable for making pig iron, it becomes very valuable for this purpose when we



apply it in such a way that its carbon can be converted into carbonic acid, and its hydrogen into water.

The next point now to be considered will be, what amount of petroleum will be required for the making of 1 ton, of 2240 pounds, of pig iron? This amount naturally differs according to the ores used. In North-western Pennsylvania it takes, on an average, in cold blast-furnaces, 90 bushels of Connellsville coke, containing 3200 lb. of carbon, to make 1 ton of pig iron from magnetic oxide, or a mixture of protoxide and oxide of iron containing 853 lb. of oxygen, in the amount of ore required to produce 1 ton of pig iron, which, therefore, requires for its reduction, 640 lb. of carbon, if the latter is converted into carbonic oxide. Of the balance of the carbon used, amounting to 3,200—640=2,560 lb., 60 lb. are required for the carbonization of the reduced metal, leaving 2,500 lb. of carbon to effect the dissociation of the oxygen from the iron, and to melt the reduced metal along with the slag materials and to cover the loss of heat by radiation, waste heat of escaping gases, etc.

The amount of heat required for the dissociation of the oxygen in the iron ore, we can calculate as follows :

1 lb. of oxygen, burned with iron, generates 6212 CUc.

To dissociate, therefore, 853 lb. of oxygen, combined with the ore producing 1 ton of pig iron, will require 853×6212=5,298,836 CUc ; from this, however, has to be deducted the heat generated by the burning of the 853 lb. oxygen, liberated from the ore, with 640 lb. of carbon, to carbonic oxide, amounting to 640×2,221=1,321,440 CUc. It therefore takes 5,298,836—1,321,440=3,977,396 CU_c, or $\frac{3,977,396}{2221}$=1,790 lb. of carbon to dissociate 1 ton of pig iron ; and 3200—640+60+1790=710 lb. of carbon, to cover loss of heat by radiation, for fusion, heat lost with waste gases, etc.

Substituting petroleum for carbon, and conducting the blast furnace process in such a manner that the petroleum used is all converted into carbonic acid and water, we must consider, first, that of the 84 carbon contained in 100 lb. petroleum, by being converted into carbonic acid, absorbs from

the ore	224	lb. oxygen.
the 13.75 hydrogen, by being converted into water, absorb	110	"
100 lb. petroleum, therefore, take up	334	"

and to reduce 1 ton of pig iron will require 334:853=100:x. and x=256 lb. of petroleum which, burning to carbonic acid, with 853 lb. oxygen set free by the reduction of the metal, will generate $\frac{256}{100}$×10,695,543=2,738,030 CUc. We shall, consequently, require for the dissociation of the iron from the oxygen 5,298,—8362,738,030=2,560,806 CUc, or $\frac{2,560,806}{1,069,543}$=239 lb. of petroleum.

The 710 lb. of carbon =710×2221=1,576,910 CU_c required for smelting, loss by radiation, waste gases, etc., we can substitute by $\frac{1,576,910}{1,069,543}$=143 lb. of petroleum.

The total consumption of petroleum, per 1 ton of pig iron will, therefore, be :

For reduction	256 lb.
For dissociation of metal	239 "
For smelting, loss by waste gases, etc	148 "
Total	643 lb.=$\frac{643}{6.69}$=96.4 gallons

Taking into consideration the much smaller size of furnace required by the substitution of hydrocarbons for solid fuel, the smaller amount of flux required and more energetic action of the hydrocarbons, we may assume, especially when aided by hot blast, that it will, probably, not require more than 2 barrels of petroleum per 1 ton of pig iron ; the substitution of petroleum for solid fuel, therefore, would be very economical in many sections of this country. Still more economical, however, will be the substitution of natural gas for solid fuel, wherever the former is met with, as in many parts of Northwestern Pennsylvania, New York, Ohio, Kentucky, West Virginia, etc.

According to the analysis of Prof. WURTZ of the Bloomfield Gas Co., (published in *American Gas Light Journal*, March, 1870, p. 82) we find the value of the natural gas as follows. The gas contains :

82.41 per cent.	marsh gas	Equal to	64.81 carbon
10.11 "	carbonic acid		21.31 hydrogen
4.31 "	nitrogen		0.26 water
0.23 "	oxygen		4.31 nitrogen
2.94 "	illuminating carbon		10.11 carbonic acid

the 64.81 carbon burning to carbonic acid require 170.7 oxygen, contained in 652 lb. of air ; the 21.31 hydrogen and 0.23 oxygen. burning to water, requires 171.48 oxygen, contained in 655 lb. of air.

The products of combustion are :

244.82 carbonic acid, 192.05 water, 970.16 nitrogen.

64.81 carbon, burning to carbonic acid, generate 64.81×79.00=	511.599 CU.
21.34 hydrogen in water	21.34×34444=735035 "
Total	1247034 CUc.
Deducting the latent heat of 192.05 water	103120 "
We have heat value of 100 lb. of natural gas	1143914 CUc.

The temperature of combustion is expressed by 1143914=244.8×0.212+192×0.847+970×0.275, or x=$\frac{1143914}{481}$=2378°C.

Incompletely burned to carbonic oxide and water, we obtain 64.81 carbon, burned, to carbonic oxide requires 85.35 oxygen contained in 328 lb. air.

21.31 hydrogen, burned to water, requires 171.48 oxygen contained in 655 lb. of air.

The products of incomplete combustion of 100 lb. natural gas to carbonic oxide and water are :

149.36 carbonic oxide, 192.05 water, 741.50 nitrogen, 10.11 carbonic acid.

64.81 carbon, burning to carbonic oxide, generate 64.81×2221=	143943 CUc.
21.34 hydrogen in water	21.34×34444=735035 "
Total	878978 CUc.
Deducting latent heat of water	103858 "

We find the heat value of 100 lb. gas, incompletely burned. 775858 CUc., and the temperature obtained thereby $\frac{775858}{411}$=1887°C.

These calculations show that liquid, vaporized or gaseous hydrocarbons, can be substituted successfully for solid fuel, only when we apply them in such a

way that, by its combustion, it is entirely converted into carbonic acid and water.

BLUNT SALISBURY proposed the use of petroleum in blast furnaces, by vaporizing the petroleum with superheated steam, and injecting it with the blast, into the chamber of combustion of the furnace. Used in this way, the petroleum vapor must be but partially burned, converting its carbon into carbonic oxide, as the latter is necessary for the reduction of the metal. The temperature which, under these circumstances, can be obtained in the hearth is, as shown before, insufficient to work the furnace to advantage. To avoid these difficulties, instead of introducing the petroleum exclusively into the hearth, together with the blast, I divide the hydrocarbon to be used in such a way, that into the zone of combustion only such a part of it is introduced as is wanted to produce the smelting of the reduced iron along with the slag materials, while the balance of the hydrocarbon required for the heating, roasting, reduction and carbonization of the metal, is injected into the upper part of the furnace (the reducing zone). To introduce the hydrocarbon, and the blast required for the roasting process, I prefer to use a central tube, descending from the trundle down to such a point in the reducing zone as is judged best for working the furnace. To protect this tube (the hydrocarbon tube) against destructive heat, I surround it by an exterior tube of larger diameter, which leaves an annular space for the circulation of hot or cold blast, which latter enters said annular space at the top, circulating around the entire hydrocarbon tube, before it escapes by appropriate openings in the exterior tube into the interior of the furnace, at a certain depth below the upper surface of the charges, but above the level at which the hydrocarbons are admitted into the reducing zone. The outside (air) tube may be protected against destructive heat by a fire-proof lining; also the outlet-openings for air and hydrocarbon be secured against shaking, and to facilitate their entrance into the interior of the furnace, by umbrella-shaped projections. By this, or other equivalent arrangement, the blast introduced into the upper part of the furnace serves both as a protection of the hydrocarbon tube, and to burn all hydrocarbon vapors or gases which may not have been utilized in the reduction and smelting of the iron. The free oxygen admitted into the upper part of the furnace, above the reducing zone, oxidizes the dileterious admixtures of the ore, such as sulphur, phosphorus, etc., and the heat generated thereby assists to expel the carbonic acid and moisture of ore and flux, and to heat and prepare the ore for the reducing zone.

Into the combustion chamber the liquid, vaporized or gaseous hydrocarbons, are introduced with, or without, the aid of superheated steam, either mixed with the blast, or separately from it, in which latter case I prefer to introduce the hydrocarbon at a level somewhat below the level where the blast enters.

The advantages which I claim for my process are: 1st. Great saving in fuel (a) on account of the greater heat produced by the perfect combustion of the hydrocarbon with the least amount of blast; (b), the complete utilization of the waste heat of the escaping gases for heating, roasting and preparing for the zone of reduction, the newly entering charges.

2d. Large increase in the daily output of metal by the great increase of the capacity of the furnace for ore, as no solid fuel is mixed with the ore.

3d. Superior quality of the metal produced, as most of the impurities of the ore and flux are eliminated by the roasting process before the charges enter the zone of reduction.

4th. The reduction of the metal is effected at such a low temperature that the least possible amount of impurities are reduced or can combine with the iron.

5th. The reduced and carbonized metal on its way toward the hearth, coming only into contact with neutral or slightly oxidizing, or reducing gases (as the metal to be produced may require), can not absorb impurities from the slag material, as is the case in blast furnaces as heretofore worked, where the reduced metal, on its way from the reducing zone toward the hearth, remains in constant contact with incandescent coal at a high and increasing temperature, and is, besides, exposed to a current of highly deoxidizing gases, which, after the complete reduction of the iron, act mainly upon the impurities of the ore and slag material, which are thereby reduced, and contaminate the reduced metal. In my process the metal reduced at low temperature, on its way from the reducing to the smelting zone, can not be contaminated by injurious substances, as it comes only in contact with neutral, or slightly oxidizing, or reducing gases, and is subjected to the refining action of the carbonic acid, which acts as a powerful agent upon the removal of sulphur, silicon or phosphorus, which may have been taken up by the reduced metal, converting them into sulphurous acid, silicic acid and phosphoric acid.

If the ores contain much phosphorus, I prefer to moisten them with a strong solution of chloride of magnesia (the refuse or mother liquor of salt works) or with chloride of manganese. The chloride of magnesia heated to redness is decomposed; its chlorine combines readily with the phosphorus of the iron, and escapes with the waste gases as perchloride of phosphorus. The chlorine of the chlorides likewise acts upon the carbon of the hydrocarbons, forming bichloride of carbon, which is highly volatile and a powerful resolvent for phosphorus. By using, in the described manner, the upper part of the furnace for heating and roasting the ores before they enter the reducing zone, the sulphur contained in the ore and flux is readily removed, as the steam formed by the combustion of the hydrocarbons decomposes the sulphide of iron as follows:—$FeS_2 + H_2O = FeO + 2SH$, which latter, by the free oxygen of the blast introduced into the upper part of the furnace, is burned to SO_2 and H_2O.

Sinking Iron Shafts for an Experimental Amber Mine.

(Zeitschrift für das Berg-Hütten und Salinenwesen, xxii., parts 3 and 4, pp. 139-146.)

The supply of amber in commerce is mainly derived from the district of Samland, near Königsberg, in Eastern Prussia, where it occurs in a deposit locally called "blue earth," in a brown coal formation of the tertiary age. Until lately amber was got chiefly by dredging and by collecting the fragments thrown up during heavy gales on to the sea-coast, or by shallow, irregular diggings a short distance inland. Recent geological researches having proved the continuity of the amber-bearing beds, the Prussian Government considered it desirable to start an experimental mine, to determine the conditions upon which concessions might be granted to private individuals, the right of working amber being one of the Crown privileges in Prussia.

The locality selected is at Nortyken, in Samland, where the amber-bearing bed has been found by boring to a depth of 140 feet. The section is as follows:

Hard blue earth, without amber . . .	2 feet
Blue earth, rich in amber	4·9 feet.
Barren earth, no amber	1 foot.

The level of the bed is 18·7 feet below the level of the Baltic. The overlying strata 140 feet thick consist of sands and clays belonging to the brown coal formation. The works planned for laying out the mine consist of two winding shafts, two bore-holes for pumping, and the necessary engines and boilers. As a large quantity of water was to be looked for in sinking, it was decided to bore the shafts and line them with wrought-iron tubes. The depth of both shafts is about 147 feet, and the distance between them is 73·8 feet.

The boring head was a horizontal bar carrying four chisels for cutting into the bottom of the hole, and two at each end radially for describing the outer curve of the shafts. It weighed about 17 cwt. The boring rods of wrought iron were of two sizes; one being an inch square, used in boring percussively; and the other, 2 inches square, used when a twisting strain was applied.

The sand pumps, or shells, for removing the detritus produced in the boring, were of two sizes; the larger being 3·1 feet, and the smaller 2·1 feet in diameter, the length in each case being 6·4 feet. They were wrought-iron cylinders with clack valves at the bottom, but the suspension was so arranged that when brought full to the surface they could be emptied by being tipped like a bucket, without the necessity of being detached from the rods.

The iron tubes lining the shafts are of the best boiler plate, 0·8 inch thick, and 4·6 feet internal diameter, in lengths of 4 feet, joined by internal rings of the same thickness and riveted. The tube is further strengthened internally by three longitudinal strips of iron of the same thickness. The bottom length of tube is of double thickness, and terminates in a cutting shoe of triangular section. The total weights of the lining tubes are 44 tons for shaft No. 1, and 45·6 tons for shaft No. 2, or rather more than 1 ton per lineal yard.

The sinking of the tubes was effected by pressure applied by screws. A cast-iron ring grooved underneath to fit the tube, and having four perforated lugs through which the pressure screws passed, was placed on the top of the tube, and the pressure was applied to the nuts by men working spanners. The lower ends of the screws were attached to a fixed point or abutment formed by a timber platform loaded with cast iron; four screws were placed at equal distances around the circumference of the tube. The spanners were slung by tackles for convenience of manipulation, and from four to five men worked at each, so that from sixteen to twenty men were employed in pressing down the cylinder. The amount of material displaced for each length of tube was about 53 cubic feet, which was removed in four or five fillings of the larger-sized shell in about six working hours. The sinking of the tube occupied about four hours, so that one complete length of the shaft tube was sunk and a fresh length slung and adjusted for riveting in each shift of twelve hours. From the sandy nature of the ground little actual boring was required, the use of the chisels being confined to cutting through beds of shale. The work was done in day and night shifts of twelve hours with an average of twenty-seven men.

No. 1 shaft was completed in 121 shifts, and No. 2 in 106 shifts, including both boring and riveting. The latter operation occupied rather more than half the time.

The total cost of the two shafts was as follows:—

Wrought-iron lining tubes	£4,093
Boring plant	1,259
Carriage	720
Labor for riveting and sinking	715
	£6,787

The water level during the sinking was constant at 32·8 feet below the surface the shaft being about 46 feet above the bottom of the valley.—*Transactions of the London Institution of Civil Engineers.*

Mechanical Ventilators for Mines.

By Mr. WILLIAM DANIEL, of Leeds.*

THE author introduced his statements on the subject by referring to a paper read by Mr. THOMAS JOHN TAYLOR, to the present institution, sixteen years ago, in which the system was advocated of ventilation of mines by means of furnaces. This system has been found, however, to be troublesome, expensive, and dangerous, not only on account of the injury done by the products of combustion to tubbed shafts, the enormous consumption of fuel involved, the extra number of men required at the top of the shaft in addition to those actually engaged at the furnace, but also the danger of explosion of gas and the firing of bituminous shale. Under these circumstances mechanical ventilation, since it was introduced last before the institution, six years ago, has made rapid strides, and there are at present 250 mechanical ventilators now in use, or in course of construction, in this country; 180 of which are Guibal, and 60 the Waddle fans. With regard to cost, at a depth of about 700 yards the outlay is about the same; and at less depths the machine becomes proportionally more economical. The furnace should never be employed except in small mines where the additional outlay would not be justified. Most, if not all, of the mechanical ventilators at present in use, exhaust from the top of the upcast shaft, in the case of pits, or at the end of the return air-course, where they are employed for day-working; and they may be divided into two classes, namely, those in which a continuous current is maintained by centrifugal action, as in the fans of GUIBAL, RAMMELL, WADDLE, and others; and those which intermittently discharge a certain quantity, to which class belong the species of rotary pumps introduced by LEMIELLE and COOKE, the piston machine of NIXON, and the reciprocating air-chambers of STURVÉ. All these machines, excepting COOKE'S, have been before described in the institution proceedings. COOKE'S ventilators consist of two circular casings placed side by side, in which revolve eccentric circular drums; two swinging shutters, suspended at, and oscillating about the shaft, receive motion from the crank, lever, and connecting rod, so as to be always close to, but not in absolute contact with, the eccentric drum; the shutter seals the outlet during the discharge of the air from the drift leading from the mine. The eccentricity of the drums is about one-fourth of their diameter; the drums are about two-thirds of the diameter of the casing, and the width of both casings and drums is about one-half the diameter of the casing. The throw of the crank is the same as the eccentricity of the drum, the center of the crank-pin coinciding with the center line of the drum. The connecting-rod and lever are both of the same length as the radius of the casing; and the bottom of the shutter is curved to a radius of the same length as the crank and the eccentricity of the drums, the curve being circular and described from the same center as the lower end of the lever. The period of inlet and discharge occupies about ·235 deg. of each revolution. The drums are placed opposite each other on the shaft, so that the revolving mass is balanced and the outward discharge of air equalized. Two of these ventilators are erected at the Upleatham and Loftshouse ironstone mines, near Saltburn. Their useful effect is measured by the quantity of air discharged, the degree of rarefaction necessary, and the power expended. The LEEDS' fan at Morley Main Colliery is a modification of the GUIBAL fan; the inlets of the air are on both sides, and to prevent interference

* A paper read before the English *Institution of Mechanical Engineers.*

of currents, a diaphragm is placed in the center of the vanes; the shutter is omitted, and the outlet replaced by a chimney. The drift is divided, and the driving shaft, except when unusually strong, requires a third bearing. The only two ventilators on COOKE's plan, at present working, are as above stated, and were adopted by the manager of Messrs. J. W. PEASE & Co., after careful examination, and the results justify his choice. In a trial of the various fans, namely, the COOKE, WADDLE, RAMMELL, LEEDS, and GUIBAL, the useful effect of the first was 64 to 58·50 per cent.; the second, 47·10; the third, 41·02; the fourth, 37·92; and the fifth, from 50·41 to 40·66. The diameter of COOKE's was 22 ft.; of WADDLE's, 36 ft.; of RAMMELL's, 32 ft.; of the LEEDS' fan, 40 ft.; of the GUIBAL respectively, 21 ft., 36 ft., 50 ft., and 30 ft. The consumption of fuel was not accurately taken, steam being borrowed from boilers already in use; but in the majority of cases, a wasteful type of engine is employed where economy might be introduced.—*Colliery Guardian.*

History of the Discovery of Silver on Lake Superior.

BY COL. CHAS. WHITTLESEY.

REPORTS of silver were so current among the early Indian traders, that as soon as the English acquired possession of the country in 1763, high hopes were entertained of its mineral value. The first company was formed in London, under the general management of ALEXANDER HENRY, of Montreal, who built a small vessel on the lake. In 1769, a party of Cornish miners reached Lake Superior and began work on the Ontonagon river, above the forks, at the famous copper boulder. They also commenced an entry in the trap bluff, on the north shore of Carp Lake, in the Porcupine mountains. These works were easily found in 1845-6, when I first examined them. Some explorations, and, possibly, some mine work was done by HENRY's company on Isle Royal and Michipocoten. Not finding silver enough to meet expenses and the distance being too great to carry copper to market, the project was abandoned in 1770. The Indians continued to bring in specimens of native silver, as they have to this day. As to its precise locality, no Indian dare show it to a white man under the pressure of temptations of money, or even of whisky. Mr. A. MEADS, editor of the *Ontonagon Miner*, has given a good example of the causes of their reticence, about the locality of minerals.

"Before going into any details of their workings, it will be, perhaps, well enough to go back a few years to the date of the discovery of silver in this district. That silver existed, somewhere in the Iron River region, has been known for years. Back, twenty and thirty years ago, when Iron River was one of the fur stations of JOHN JACOB ASTOR, and the American Fur Company, the Indians were known to have silver in its native state, in considerable quantities; and men are now living who have seen them with large chunks as big as a man's fist; but no one ever succeeded in inducing them to tell or show where the hidden treasure lay. A superstitious fear clung to them, and does even to this day, that if they showed any white man a deposit of mineral, the Great Manitou would punish them with death. We have had two instances of this kind come under our notice, which proves the superstitious fear of these poor children of the forest. Several years since, a half-breed Indian brought in some very fine samples of vein-rock, carrying considerable quantities of native silver. His report was that his wife had found it on the South Range, where they were trapping, and to test his story we sent him back for more. In a few days he returned, bringing with him quite a chunk, from which we obtained eleven and one-half ounces of native silver. He returned home, went among the Flambeaux Indians, and was killed. His wife, to this day, refuses to listen to any proposals or temptation from friend or foe to show the location of this vein, clinging with religious tenacity to the superstitious fear of her tribe."

In 1846-7, soon after Dr. HOUGHTON was drowned, it was reported that he had discovered a silver-producing vein on Eagle River, between the Falls and the Phœnix mine. Geologically, this would be in the alternating bands of trap and sandstone, below the conglomerate, and above the scoriaceous or "ash bed" trap. Since that time nothing has been heard of this discovery. Dr. C. T. JACKSON about that time, reporting upon what is now the Phœnix mining property, found in one of the western branches of the main vein, so much silver that he regarded it to be more a silver than a copper lode. Native silver has been found in most of the mines of native copper, on the Keeweenaw Range; in specks, blotches, and irregular bunches, adhering to the copper, but in quantities too small to warrant mining for silver. The Cliff mine has realized $5,000 a year in silver, which represents but a small part of the product of the mine. As early as 1846, BELA HUBBARD, of Detroit, one of Dr. HOUGHTON's assistants, saw what he regarded as galena, or sulphuret of lead, in small veins, fissures and joints, near the mouth of Iron River, which are now being worked. This lode is between the *black slate*, which lies above the conglomerate and the Potsdam red sandstone, more fully explained below. All these hints and premonitions, extending through one hundred years, produced very little effect with experts; because the geological character of the rocks does not correspond with that of any known silver producing region. It is the same with our lodes of native copper. Their counterpart is not found in any copper producing region of the world. Silver is a very widespread mineral, found in rocks of various geological eras, and, therefore, like our copper, may exist in workable quantity under new geological relations. It is discouraging to explorers, to have no assistance and no guidance, from comparisons with other mining districts, yet is not conclusive against any region. But in such cases there must be more caution, in forming an opinion upon surface indications.

On the north shore of Lake Superior, geologists have long anticipated valuable lodes of silver or its ores, because the rocks are propitious. It was found there in true veins in the metamorphic slates, a quarter of a century since, sometimes with galena, and at others in the form of pure metal. Most of this territory, however, lies beyond the American lines. No silver or gold region can be relied upon for profitable mining until after trial by actual working. The developments of the past five years, on the north shore, indicate a large and regular product. On the south, or American shore, Mr. AUSTIN CORBER, in 1855, discovered the first regular lode, of which silver is the leading mineral. It is situated on Little Iron River, a small stream about a mile west of Great Iron, or Pewabic River, where Mr. HUBBARD and other geologists had noticed it many years before. Mr. CORBER kept his secret, and in due time secured the land. It now belongs to the Scranton Mining Company. In 1872, specimens from this property, and from the lode on Iron River, found their way to the Lower Lake cities. They showed particles and flakes of native silver, without the use of magnifiers. In 1873-4, mining companies were organized, covering a large tract around the mouth of Big and Little Iron rivers. During the year 1875, a reducing mill was erected on the premises of the Ontonagon Company, about a mile and a half from the Lake. The following statement shows the reported results:

Name of Mine.	Tons of Rock.	Result per Ton.
Ontonagon	22	$33 28
Scranton	4	45 28
Superior	5	46 47
	31	Average $41 64.

Neither the crushing nor the amalgamating processes are perfect. The estimate for current expenses, to cover mining, crushing, and amalgamation, is twenty-six dollars per ton of 2000 pounds. As yet none of the mines are sufficiently developed to determine the precise cost of mining, and reducing; but the above estimate appears to me large, for mines operating on a large scale. In 1854 I had the means of knowing the total cost of working a copper mine on Lake Superior; wrought on a transverse vein that stoped 17,500 fathoms. Its width averaged one and a half feet, or eighteen inches, producing four and three-fourths tons to the fathom. Every expense was charged to the product, including interest, repairs, dead work, stamping, transportation and smelting. It was found to be a few cents less than twelve dollars per ton. To this for silver must be added the cost of amalgamation. Some heavy copper bearing beds have been wrought at one half the expense of the true veins.

GEOLOGICAL FORMATION.

The Iron River matrix is a *grey sub-crystalline quartz*, in the form of a layer between a roof of fine grained *black slate* and a floor of *red sandstone* of the age of the Potsdam.

Numerous contortions have taken place in these strata since their deposition, and to complicate the matter still more, the ancient glacier action, has planed off the crowns of the undulations. The outcrop of the lode here is more crooked than the letter S, dipping in various directions, at an angle generally less than thirty degrees with the horizon. It is possible there are more quartz layers than one, and more than one belt of slate. On Mineral Creek, where the slate is well exposed in T. 50, R. 40, sections 16, 17, and 18. the strike of the bed is nearly east and west. It rests on conglomerate and is overlaid by the universal red sandstone. To the eastward it tapers out and is lost before reaching the Ontonagon river. About twelve miles nearly west, in the north-east corner of town 50, R. 42, a bed of black slate is reported, on the Nonesuch property. It does not follow that the Mineral Creek bed connects with the Nonesuch, but it should connect with this or the Iron River slate, which is six miles to the north-east. One of the marked features of the Lake Superior system, is the changes that occur in strata, thinning out or thickening up in short spaces, so as to be lost, or materially altered in every respect.

The rocks were originally different at points not very distant from each other, and most of them have since their deposition undergone metamorphism. At the mouth of Iron River there are portions of the black slate, quite compact, coming out in flags or flat slabs, with numerous joints, having a ringing sound like trachyte. This does not prove it to be a different stratum from that at Mineral Creek. The Nonesuch slate may also be a portion of the same, and it is reported to carry silver. There is a wide field for conjecture on many points, until much more exploration has been done. Such slates, where they have been subject to contortions and the general changes due to intrusive rocks, or to metamorphism from any other cause, invariably show segregations of quartz, which may take the form of bunches, seams, ledges, or of veins. Here the cause of such segregations is very apparent. Not far beneath the silver lode at Iron River is a bed of trap, which may be traced to the north-west. past the Union mine, through MCLAUGHLIN's hill to, and along the north shore of Carp Lake, bending back on the west, across Carp River to the south. South of Carp Lake an immense mass of brick-red porphyritic trap has risen up into the older system of gray and brown trap, lifting and pushing the latter northward in such manner, as to form the jagged outlines of the Porcupine mountains. This movement carried the incumbent strata of sandstone, conglomerate and slate forward in the same direction. The sedimentary beds thus fold around the trap beds, on concentric curves. Such movements always produce galvanic action, by means of the unequally heated condition of the rocks; and to this agent we probably owe the concentration of minerals in fissures, floors, bunches and veins. The quartz seam, between the slate and sandstone, may be regarded as vein matter, occupying the plane of junction of the two rocks. Besides silver, it is not yet determined what metals it contains. Farther west, at the mouth of Black River, the slate carries fine copper, as it does at Iron River. It probably carries silver, outside of the quartz course, especially in parts next the lode. It is composed principally of silex, but has a notable per cent of carbon, and of black oxide of iron. This slate belt I have traced westerly across the Presque Isle, Black, Montreal and Opinike Rivers, a distance of eighty miles, where it thins out near the Bad River and disappears. On the Montreal, it is 750 feet thick, tilted up to the north at angle of 85 to 90. If it produces silver along its entire outcrop, this region may yet rival the north shore as mining ground.

CLEVELAND, O., 1875.

Notes.

The Susquehanna Coal Co. is shipping about 1,000 tons of coal per day from Delaware City, south of Philadelphia.

Lykens Valley Coal Trade.—The shipments of coal from this religion for the fiscal year ending November 30, 1875, amount in all to 509,501,16 tons, *the largest shipments ever made from this section.* Following are the amounts in tons and hundred weight of each colliery, with the increase or decrease over last year's shipments: Short Mountain Colliery 152,379,00 - increase 25,604,11 tons; Summit Branch Colliery 290,-878.02—increase 64,654.10 tons; Big Lick Colliery 66,244.14—decrease 35,113.00, making a total increase for the year of 55,146.01.—Lykens Co. *Record.*

Shipments of coal from the Cape Breton and Pictou mines have well nigh ceased for the season. The Nova Scotia Coal Company, Pictou County, stopped shipping from their mines last week. For the week ending 20th November, the following returns from the Pictou mines were published: Halifax Co., 1,551 tons; Intercolonial, 1,232 tons; Acadia Co., 628 tons; Vale Colliery, 2,024 tons. Total—5,435. The Local Government is asked by petitions from the miners in Cape Breton to furnish them either with work, or provisions to carry them through the winter.

The Gwynne-Harris and Lowe Gas Processes.—Statement of gas made and materials used, during the month of September, 1875:

	By the Citizen's Gas Co. of Poughkeepsie, N. Y., using the Gwynne-Harris process.	By the Utica, N. Y., Gas Co., using the Lowe process.
Anthracite, stove & grate size,	tons 36·1573	92·1955
Bituminous coal	" 3·458	none.
Crude petroleum	gallons 4,333	9,477
Coal tar, for fuel,	bbls. 55	none.
Gas made	cubic feet 1,164,700	3,050,600
Candle power, by jet photometer	17·10	20
	Labor, 2 men, day and night.	men, da and night.

Illuminating Gas.

Address by Prof. CHANDLER, before the Gas Light Association.

CONTINUED FROM PAGE 553.

THE gas from caking coal is inferior in illuminating power, but this deficiency is supplied by the use of a certain proportion of richer cannels and other enriching materials. The table which you see here illustrates the character of a few of the important gas coals and enrichers.

The percentage of sulphur in gas coal is a matter of considerable importance, as, while about half of this sulphur remains in the coke, the other half passes into the volatile products, and is divided between the gas, the ammonia water, and the tar. As the sulphur contained in the gas must be removed in the process of purification, the cost of this part of the process increases with the percentage of the sulphur contained in the coal. The sulphur is present in the coal chiefly in the form of iron pyrites. Some American gas coals contain considerable percentages of sulphur. The Nova Scotia coals (Glace Bay, Bridgeport, International, etc.,) contain from three to five per cent. ; Redbank, Pa., 0·89 ; Westmoreland, Pa., 1·50 ; Murphy's Run, West Virginia, 1·88 to 3·06 ; Orrell, England, 1·75 to 2·34. The last column in the table shows the number of feet of gas purified by one bushel of lime, which is a tolerable indication of the amount of sulphur which goes into the gas :

	Volatile matter	Fixed carbon.	Ash.	Gas per ton of 2240 lb. in cubic feet.	Candle power of gas.	Coke per ton of 2240 lb.		Gas purified by one bushel of lime, in cubic feet.
						Lb.	Bush	
I. CAKING COALS—								
Newcastle, England.	32.70	65,55	1·75	10057	10.11	1536	49	3500
Glace Bay, Cape Breton...	....	....	..	9560	12.50	1484	38	1945
Lingan, Cape Breton.. ...	35.20	60.80	4.00	9520	12.92	1456	42	2200
Block House, Cape Breton,	40.80	57.70	1.50	10217	17.32	1460	40	2304
Pittsburgh, Pa	36.76	55.93	7.07					
Westmoreland, Pa	36.00	58.00	6.00	10642	16.62	1544	42	6420
Sterling, Ohio	37.50	56.90	5.62	10328	18 81	1480	36	3933
Despard, West Va.....	40.00	53.30	6.70	10763	20.41	1540	36	2494
II. CANNEL COALS—								
Kirkless Hall, England....	40.30	56.40	3.30	10012	21.47	1410	36	2000
Darlington, Ohio	43.00	40.00	17.00	98.0	34.98	1320	32	2806
Peytona, West Va.....	46.00	41.00	13.00	13200	42.79	1380	32	4510
III. ENRICHING MATERIALS—								
Boghead Mineral, Scotland	51.60	15 70	32.70	13619	26.45	1378	35	3402
Grahamite, West Va	53.50	41.50	2 00	15000	28.70	1056	44	
Albertite, Nova Scotia ...	57.70	41.90	0.40	14784	49.55	806	16	
Hartley Mineral, Australia	82.50	6.50	11 00	13716	131.00	424	..	5686

THE MANUFACTURE OF COAL GAS.

THE manufacture of coal gas includes three distinct operations : (1) The distillation of the coal. (2) The separation of the water, tar, and other condensable matter—*condensation* ; (3) The removal of sulphur compounds and carbonic acid—*purification*.

The distillation of the coal is effected in the retort, which is a long, horizontal, semi-cylindrical vessel, formerly made of iron, but now made of clay, in some localities being opened at both ends and charged at both ends, though generally they are charged at one end. They are set in groups or benches of three, five, six or seven, heated by one fire of coke. In Paris the Siemens regenerating furnace has been introduced for heating gas retorts. At the Vaugirard station one furnace furnishes fuel for 128 retorts, set in benches of 8, with regenerating chambers, beneath each bench. The saving in fuel is said to be about 29 per cent.

The work of charging the red hot retorts and drawing the coke is very laborious and exhausting, and an effective machine for performing this duty has been invented by Mr. T. F. ROWLAND, of Greenpoint, N. Y. The working model certainly accomplishes all that can be desired.

The intensity and duration of the heat to which the coal is exposed, are matters of great importance. For iron retorts a dull cherry (1478° F.) to a clear cherry-red heat (1830° F.) is most suitable. For clay retorts a deep orange (2010° F.), to a clear orange (2190° F.), or even a white heat as (2370° F.) is employed, the coal itself being exposed in either case to 1500° to 1600° F. The effect of too low a temperature is to produce a larger proportion of condensable vapors, which are lost in the form of tar, while too high a temperature injures the quality of the gas by decomposing it into non-luminous marsh-gas, and hydrogen. When the charge of 160 or 200 pounds of coal is first introduced into the hot retort, the outer layers only of the coal undergo distillation, yielding condensable vapors very rich in carbon ; these, passing through the red hot retort on their way out, are decomposed into fixed gases of high illuminating power. As the heat continues, these outer layers of coal become converted into coke, which is soon raised to a red heat. In the meantime, the heat reaches the interior of the charge, and the vapors produced, passing through the red-hot layers of coke, are, in turn, converted into fixed gas. As each successive portion of vapor has to pass over a larger surface of red-hot coke, it is more and more completely decomposed, and its percentage of carbon, and, consequently, its illuminating power, reduced. For this reason the quality of the gas deteriorates as the process of distillation continues, till, finally, little besides hydrogen is evolved. At the last stages of the process, the sulphur contained in the coke is said to form bisulphide of carbon, which is a most objectionable impurity. It is considered better, therefore, to interrupt the process at the end of four hours, than by continuing it, to impair the quality of the whole product by the poor gases of the latter stages of the distillation. To prevent the reduction of the illuminating power of the gas by too high a temperature, it is also necessary to remove the gas from the retort as soon as possible, and not to permit its pressure to be increased by obstacles to its ready escape. For the accomplishment of this object an exhauster, or gas-pump is employed, not so much to suck the gas out of the retort (the partial vacuum produced in the retort rarely exceeds one inch of water-column in the pressure-guage) as to push the gas ahead through the condenser, washer, and purifiers into the holder, and thus make room for more gas to follow from the retort. The effect of too low heats is shown to an exaggerated degree in the comparison of results which you see on this diagram, obtained from the same coal when distilled at a bright red heat for gas, and at a heat hardly red (750° to 800° F.) for coal oil. One ton of 2240 pounds of Newcastle coal yielded :

1. When distilled for gas, at a high temperature.		2. When distilled for oil, at a low temperature.	
Gas.....	7,450 cu. ft.	Gas.....	1,400 cu. ft.
Coal-tar.....	18½ gals.	Crude oil.....	68 gals
Coke.....	1,200 lb.	Coke.....	1,280 lbs.

THE CONDENSER.

The condenser consists of a series of iron tubes placed in the open air, or, more commonly, in cisterns of cold water. By a simple contrivance the tar and ammonia water which separate from the gas as it traverses the condenser, readily flow off into their respective wells. From 50 to 100 feet of tube surface is allowed for every 1000 feet of gas to be cooled per hour. At the works of the New York Gas-Light Company, a multitubular condenser is in use, consisting of two sets of 8 boxes, each containing 100 tubes, 3 inches in diameter and 15 feet long. The gas passes up in one set of tubes and down in the next, through the entire series of sixteen boxes, thus traversing 240 feet of 3-inch pipe, cooled by a constantly changing water supply outside. The action of this condenser is more than its name implies. While the warm gas contains steam and various condensable vapors, which are liquefied and separated here, it also bears along a considerable quantity of tar in the form of globules, spray or fog, too minute to be deposited by gravity. This tar is already condensed to liquid, and it requires for its separation actual contact with a bath of tar, as in the hydraulic main, or with surfaces wet with tar, as in the tubes of the condenser ; the tortuous journey is also favorable to the *licking up* of the tar globules by the tarry surfaces.

THE WASHER.

The gas next enters the washer, and then, at many works, a scrubber, both designed to render more complete the separation of the tar and ammonia, and also to separate some of the sulphur compounds. The washer consists of a series of compartments through which the gas passes, and where it is exposed to jets of water. At the east-side works of the Manhattan Company, the washer consists of a series of 36 cells, 3 feet square and 10 feet high, each supplied with two jets of water, which enter at the side and are thrown into spray by impinging against an iron plate. The gas passes through the entire series.

THE SCRUBBER.

The scrubber is a large chamber partially filled with coke, fragments of fire brick or paving stones, which are kept constantly wet by a spray of water.

APPARATUS OF ST. JOHN AND ROCKWELL.

I call your attention to an apparatus which has been brought into very successful use in this city, which it will be worth your while to see. It is the apparatus of ST. JOHN & ROCKWELL for taking the place of the ordinary washing apparatus. In the ordinary process the gas from the retort is passed through the condenser, washer, and scrubber. The object of the condenser is simply to cool the gas, and permit as much as possible of the tar and ammonia water to separate, the former by adhering to the surfaces, the latter by condensation. The free use of water on gas is found to be objectionable, as some of the rich gases and vapors present are dissolved out of it and the illuminating power is reduced thereby. For this reason dry scrubbing is sometimes resorted to, or washing and scrubbing with the ammonia water derived from the gas itself. Messrs. ST. JOHN & ROCKWELL have devised an apparatus which takes the place of condenser, washer, and scrubber, and entirely avoids the use of any water save that condensed from the gas. It consists of a series of compartments, by which the gas from the hydraulic main is made to bubble through the tar and ammonia water, and to pass over a lattice-work of corrugated plates of iron, which catches the tar globules.

I was called upon to investigate the working of this apparatus, and with my assistants superintended for a week, day and night, the Harlem Gas Works, where this apparatus is now used, the results were extremely satisfactory. We used 163,120 pounds of Penn coal, and 470,445 Murphy Run coal, about ¼ Penn coal and ¾ Murphy Run, in all 633,565 pounds, which produced over 3,000,000 feet of gas. We found the average yield to be about 10,897 to the ton of coal in a week's run, and this gas being tested by the photometer, showed an illuminating power of 17·06 candles. 11,000 feet of 17 candle gas, from Murphy Run coal with an admixture of ¼ of Penn, I considered a very satisfactory result. The gas is very clean. We found that it contained, after being purified with oxide of iron, only 2·65 grains of ammonia and 23·58 grains of sulphur in 100 cubic feet. Prof. WURTZ, in January, 1875, reported the results of his analysis of the gas before and after it passed this apparatus. The result is shown in this table. The numbers in the first wo columns represent grains in 100 cubic feet.

	Crude Gas from Hydraulic Main.	Gas after passing the apparatus.	Percentage of each impurity removed.
Water.....	3515	2675	23.92
Tar.....	515	44	91.46
Soot, dust, etc.....	266	56	79.05
Naphthaline.....	123	25	79.77
Ammonia	339	237	30.18
Sulphuretted Hydrogen	1235	1105	10.51
Carbonic acid	1698	1522	10.36

The following report of the operations of this company for the past four months, shows that this method of separating tar and ammonia water still continues to give results fully equal to those I have mentioned:

	June.	July.	August.	Sept.
Murphy Run coal used, lb.....	2,315,500	2,372 100	2,578,800	3,108,800
Penn " " "	92,400	....	94,200	.....
Total coal used, "	2,407,900	2,372,100	2,673,000	3,108,800
Gas manufactured, cubic feet	12,049,000	12,034,000	13,298,000	15,560,000
Yield per pound....	5.01	5.07	4.97	5.01
Photometric test, candle-power.....	17.65	17.79	18.17	18.27

—*American Gas-Light Journal.*

TO BE CONTINUED.

Miners' Strike in Wyoming—Chinamen Employed.—A press dispatch, dated Omaha, Neb., Nov. 27, 1875, says :

"Information was received here to-day that the coal miners' strike at Carbon and Rock Springs, Wy. T., has ended. Governor THAYER, of Wyoming, took four companies of United States troops to the mines to protect the works and the 100 Chinamen hired by the Union Pacific Railroad Company. Only forty-eight of the whole force at both mines have been re-employed. The remainder have been offered passes to Omaha or Ogden, and are leaving the country. Forty-one of these men arrived here to-day. The Union Pacific Railroad Company intend to fill the complement of working force with Chinamen."

CORRESPONDENCE.

Lime in the Blast Furnace.

IN a paper on the use of caustic lime in the blast-furnace, read by Mr. BELL before the Iron and Steel Institute, he said substantially as follows:

With a furnace requiring 104.012 thermal units in the manufacture of a ton of iron, probably 6.58 cwt. of carbon in the state of carbonic oxide is converted into carbonic acid, and 1.92 cwt. of carbon is introduced as a constituent of the limestone. Hence, if no reduction of carbonic acid to carbonic oxide took place, 8.50 cwt. should be found oxidized to carbonic acid, for each ton of iron made. Instead of this quantity only 5.47 was so found. This change in the composition of the escaping gases causes loss of heat as follows:

Heat absorbed by splitting up carbonic acid containing 3.03 cwt. of carbon....	9.696
This decomposition carries off 3.03 cwt. of carbon, involving a loss of.	7.272
	16.966
Heat required for expelling carbonic acid from 16 cwt. of limestone	5.920
	22.888

Of this 22 per cent. of the total heat required in the manufacture of a ton of iron, 16 per cent. is due to the use of limestone; and should theoretically be saved by the use of burnt lime. On trial of lime and of limestone, the following results were obtained:

Tons iron made	419	444	404	451
Average No.....	3.19	2.20	2.65	2.10
Coke per ton, cwt	29.06	29.02	29.31	27.99
Yield of ore per cent	41.9	42.6	42.0	42.6
Limestone per ton, cwt	14.53	....	15.89	....
Burnt lime " "	....	11.44	....	11.46

That the actual saving was not as great as theoretically it should be, is explained by the assertion that the cooling of the escaping gases by the limestone, to a certain extent, promoted the decomposition of the carbonic acid. By analysis the gases were found to contain less carbonic acid when using lime than when using limestone; the decrease in quantity being more than sufficient to account for the difference between actual and theoretical saving.

It would seem that Mr. BELL assumes that the carbonic acid of the limestone must be split up in the furnace, and that the quantity of carbonic acid in the escaping gases would be the same, using either lime or limestone. Suppose, however, this assumption to be incorrect and the carbonic acid not to be split up, the carbonic acid of the gases, while using limestone, would be equal to that in the gases while using lime, increased by the amount in the limestone.

Then—

The limestone used.....	14.53 cwt.	15.89 cwt.
Burnt lime	11.14 "	11.46 "
The difference is the CO_2 expelled before charging.	3.09 "	4.43 "
This is the CO_2 of limestone	7.02 "	10.07 "
Heat required to expel CO_2 from 1 cwt. of limestone	373 T.U.	
" " " " " above weights "	2.618 T.U.	3.756 T.U.
104.012 T.U. being required for making 1 ton of iron, the heat saved would be.....	2.52 per ct.	3.61 per ct.
Representing coke	.73 cwt.	1.06 cwt.
C of CO_2 less when using lime, than when using limestone..	.84 "	1.21 "
The heat produced by burning these weights of C to CO_2	6.920 T.U.	9.680 T.U

The above statement would show that the actual saving agreed with the theoretical, as nearly as could be expected. The difference of .71 cwt. in the first example is, probably, necessary to raise the grade of the iron from 3.34 to to 2.20.

The temperature of the gases, while using burnt lime, would increase, but as the quantity would decrease there would, probably, be as much heat carried out in the one case as in the other.

The diminution of carbon, existing as carbonic acid in the gases, shows, by Mr. BELL's method of calculation, a greater loss of heat, as will be seen by the table, than was saved by the use of caustic lime—a fact he mentions, but does not attempt to explain, proposing, however, to make additional analyses, in order to ascertain if the previous work was not incorrect.

Since the theory that the carbonic acid is not split up, explains all the facts, while Mr. BELL's explanations are unsatisfactory, it would be safe to conclude that the analyses are correct, and the facts just as stated, but that his calculations are based on a false assumption.

FURNACEMAN.

SELECTED LIST OF PATENTS.

FOR THE WEEK ENDING NOV. 27, 1875.

RELATING TO MINING, METALLURGY, GAS MAKING, ENGINEERING, &c. REPORTED FOR THE "ENGINEERING AND MINING JOURNAL" BY LOUIS BAGGER & CO., SOLICITORS OF PATENTS, WASHINGTON, D. C.

169,960. Lids for Gas Retorts, Henry Collinson, Boston, Mass.—The end of the cotter-bar is provided with a spring, over which a latch pivoted to the mouthpiece or seat of the lid catches. A large skeleton eccentric is fitted into the lid, and bears upon it near its circumference. The sliding eccentric motion of the lid upon its seat, produced by turning the screw, is prolonged by the spring on the cotter-bar bearing on the latch first, and gradually yielding till the bar is pressed firm against the latch.

170,066. Explosive Compounds, Henry J. Detweiler, Bethlehem, Pa.—The detonating compound consists of ground bark or saw-dust, chlorate of potassa, and amorphous phosphorus, substiantially in the proportionsset forth.

170,093. Ore Roasting Furnaces, Wm. McCall, San Francisco, Cal.—Fire is built in a central chamber, on two opposite sides of which are the ore-chambers Flues from the central chamber extend around the ore-chambers, so that the latter are heated on all four sides.

170,142. Coal and Ore Separators, Jno. B. Wilford, Philadelphia, Pa.—The reciprocating jig-box having delivery edges at different heights, and alternating along the side or sides of the jig-box, in combination with a hood contiguous to each of the lower delivery edges.

169,947. Tuyeres, Frederick Balender, Cincinnati, Ohio.—The large slat between the bars is divided into small slats by the plate. The inclined plate deflects upward to the fire, the currents of air thrown into the tuyere-box.

169,973. Gas Apparatus, J. H. Eichols, Brooklyn, N. Y.—The retorts are connected together at their ends, which project outside of the walls of the furnace, and the ends are provided with screw-plugs, which may be removed by cleaning the retorts. A horizontal partition in the heating chamber divides it into two ovens, and causes the products of combustion to pass forward through the first oven, then back through the second oven.

The Baltimore & Ohio Railroad Company have made arrangements for running a new line of steamers from Baltimore to Liverpool. The vessels are English, and named Lake Champlain, Lake Nepigon and Lake Erie. Each of the vessels is 2,300 tons. They will be principally used for the transportation of grain from Baltimore. The first vessel is now on her way from Glasgow. The line is owned by the Canada Shipping Co., of Montreal, and is to be known as the Beaver Steamship Line.

STATISTICS OF COAL PRODUCTION.

Duties.

Anthracite free, *Bituminous*, per ton of 28 bushels, 80 lb. to he bushel, 75c., gold.

All *slack*, or *culm*, such as will pass through a half-inch screen, per ton of 28 bushels, 80 lb. per bushel, 40c. gold.

Not otherwise provided for, per ton, 40c. gold.

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines.

Comparative Statement for the week ending Dec. 4.

	1875.		1874.	
	Week.	Year.*	Week.	Year.
Wyoming Region.				
D. and H. Canal Co	57,260	2,837,488	49,235	2,222,766
D. L. and W. RR. Co....	57,729	3,106,192	56,366	2,340,841
Penn. Coal Co	24,639	1,277,390	27,277	1,245,011
L. V. RR. Co.....	9,990	874,583	9,645	880,361
P. and N. Y. RR. Co.....	460	85,621	....	57,596
C. RR. of N. J	45,868	1,367,078	39,930	1,416,178
Penn. Canal.....	12,759	297,500	1,187	321,374
Lack. and B. RR.....	..	81,493	..	112 529
	195,946	9,927,343	183,640	8,602,656
Lehigh Region.				
L. V. RR. Co	33,479	2,046,480	39 215	3,001,368
C. RR. of N. J.....	35,809	744,953	30,025	1,116.462
D. H. and W. B. RR.....	2,331	77,801	1,329	39.552
	71,619	2,869,234	70,569	4,157,388
Schuylkill Region.				
P. and R. R. RR. Co.....	133,489	4,539 574	89,111	5,089,581
Shamokin & Lykens Val.	21,448	1,151,275	10,089	880,511
	154,937	5,690,849	99,200	5,970,092
Sullivan Region.				
Sul. and Erie RR. Co....	698	11,858	328	32,385
Total.....	423,200	18,499,284	353,737	18,762,521
Increase.....	96,463	..	..	..
Decrease.....	..	265,237	..	..

* Year beginning January 1st.

The above table does not include the amount of coal consumed and sold at the mines, which is about seven per cent. of the whole production.

The following Table does not give the entire production of our Bituminous mines, but it is by far the fullest report published.

The Production of Bituminous Coal for the week ending Dec. 4, was as follows:

Tons of 2,000 lb., except where otherwise designated.

Cumberland Region, Md.	Week, Tons.	Year, Tons.
Tons of 2,240 lb.....	38,831	2,193,058
Barclay Region, Pa.		
Barclay RR., tons of 2240 lb.....	4,412	313,496
Broad Top Region, Pa.		
Huntingdon and Broad Top RR.....	3,834	200,276
*East Broad Top	1,696	46,437
Clearfield Region, Pa.		
*Snow Shoe	934	57,192
*Tyrone and Clearfield.....	19,704	821,398
Allegheny Region, Pa.		
*Pennsylvania RR.....	3,490	200,880
Pittsburgh Region, Pa.		
*West Penn. RR	3,363	201,842
*Southwest Penn. RR.....	500	23,099
*Penn. & Westmoreland gas coal, Pa. RR.	17,320	656,798
*Pennsylvania RR.....	6,256	395,376
Kanawha Region, W. Va.		
†Chesapeake and Ohio RR.....	5.741	166,517

* To Nov. 28. † Nov. 20.

The Production of Coke for the week ending Nov. 21.

Tons of 2000 lb.	Week. Tons.	Year. Tons.
Tyrone and Clearfield.....	..	283
Alleghany Region.....	..	58
West Penn. RR.....	643	46,584
Southwest Penn. RR.....	7,806	498,196
Penn. & Westmoreland Region, Penn. RR.	803	32,763
Pittsburgh, Penn. RR.....	2,232	103,505
Total.....	11,484	681,391

The receipts at Port Richmond for the week were 60,000 tons, shipments 45,000 tons, and balance on hand 178,000 tons.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Pennsylvania Railroads amounts to 61,477 tons.

The Receipts at Perth Amboy for the week were 8,958 tons, shipments 0,457 tons, and balance on hand 53,487 tons.

The Exports of Coal from Baltimore for the week were 000 tons, and for the year, 34,695 tons as compared with 65,366 tons to the corresponding time in 1874.

Receipts of Coal at Boston, for week ending Dec. 3, and years from September 1st, 1874 and 1875.

From	Week. Tons.	Previously. 1875. Tons.	1874. Tons.
Alexandria and Georgetown	2,400	37,131	41,412
Philadelphia.....	12,959	253,302	206,510
Baltimore.....	1,540	45,546	54,165
Other places.....	3,691	104,784	87,671
Great Britain.....	—	704	1,363
Nova Scotia.....	—	10,922	12,609

Shipments from Pictou, N. S., for the week ending Nov. 27:

	Tons. Week.	Year.
To United States.....	691	28,121
" West Indies.....	—	3,971
" South America.....	—	4,772
" Canada	—	140,878
" Other Provinces.....	695	66,414
	1,386	244,156

Belvidere Delaware RR. report:	Week.	Year 1875.	Year 1874.
Receipts of coal at Coal Port (Trenton)	6 788	188,903	264,440
" " " South Amboy....	11,677	253,470	588,526
Shipments of Coal Port (Trenton).....	5,565	184,836	262,578
" South Amboy.....	9.079	318,404	587,551

Shipments from Block House, Cow Bay, C. B., to the following destinations, from Nov. 8 to Nov. 29, 1875:

	Week.	Year.
Provinces.....	414	7,774
West Indies	—	1,393
United States.....	—	11,039
	414	20,206

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Dec. 10, 1875.

Anthracite.

The anthracite coal trade is very dull. Buyers have lost all confidence in prices, which are very much demoralized. There is nothing to indicate that the large companies are not firmly maintaining prices, but there is, nevertheless, more than enough coal, to supply all the wants of the market, offering at prices ranging from 15c. to $1, per ton below Combination rates. A portion of the coal thus offering comes from the Pennsylvania Coal Company, and it is supposed that the balance comes from the small companies of the several regions. If the large companies adhere to their policy of maintaining prices, and do not find some way to curtail the out-put of at least the small companies, or induce them to sell at the circular rates, there are indications that they (the large companies) will have to close their collieries until the spring trade opens, as there is not enough demand to remove even the existing stocks, without speaking of newly mined coal. This policy of the Combination, at the present time, would seem to support the smaller companies during a time of depression, and to admit the larger ones only when prices are advanced through the inability of the small ones to meet the demand. There will however, have to be a sort of a sub-Combination, or the smaller companies will ruin each other, as they are cutting prices. The existing state of things, is not likely to last long. As we have stated frequently in the past, the interests of all are too similar to permit of the ultimate dissolu-

tion of the present organization, although it is evident that the programme for 1876 will have to be placed on a business, rather than a confidence basis.

The Schuylkill operators have realized the necessity of joining the Reading Company in suspending operations until the immense stocks of coal shall be worked off in part, at least. The following appeared in the Philadelphia *Ledger* of yesterday:

"As already announced in the *Ledger*, the collieries under the control of the Reading Coal and Iron Company were nearly all closed on Saturday last, and the others owned by them will soon do so. It was then announced that the suspension would probably be general. At a meeting of the Coal Exchange in this city yesterday, which embraced about one-half the operators engaged in mining, it was resolved to cease operations on the 18th instant for at least one month. The reason given for this action is over-production. Notwithstanding the five months of enforced idleness during the Spring and Summer, the coal now on hand is far in excess of the demand. This will throw out of employment at least 35,000 men"

The companies of the other regions have not indicated what may be their action relative to curtailing their output. The combination will meet on the 20th inst., when it is supposed this question will be acted upon.

The Philadelphia and Reading Railroad Company reports the following as the tonnage of its main line and branches and the Schuylkill Canal for the fiscal year ended November 30, as compared with the year previous:

	Tons.	Cwt.
Total tonnage of main line and branches during 1873–74	6,348,812	07
Do. do. 1874–75	5,505,454	16
Decrease	843,357	11
Total tonnage of Schuylkill Canal during 1874–75	734,694	01
Do. do. 1873–74	717,506	18
Increase in 1875	17,187	03

The Lehigh Valley Railroad Company, which ended its fiscal year at the same date, makes the following summary of its business:

Receipts of Anthracite coal

	Tons.	Cwt.
From the Wyoming Region	1,018,786	12
" " Hazleton "	1,439,906	19
" " Upper Lehigh Region	1,479	08
" " Beaver Meadow "	364,665	01
" " Mahanoy "	432,146	05
" " Mauch Chunk "	2,420	18
North from Easton	18,166	09
Total	3,277,571	12
Total last year	4,150,659	10
Decrease during 1874–75	873,087	08
Receipts of Bituminous coal		
From P. & N. Y. RR	6,489	19
" all other sources	49,410	11
	55,900	10

The Pennsylvania and New York Railroad Company, whose fiscal year also ended November 30, summarizes its business as follows:

Anthracite coal received	Tons.	Cwt.
From Lehigh Valley RR	485,818	03
" Lack. & Bloomsburg RR	164,094	16
" Pleasant Valley Branch	85,161	05
" Sullivan & Erie RR	12,999	00
Total	748,072	04
Total for 1873—74	714,030	09
Increase	34,042	15
Bituminous coal received		
From Barclay RR	334,500	04
" Northern Central RR	690	16
Total	335,191	00
Total for 1873—74	302,717	02
Increase	32,473	18

The Production of anthracite coal for the week ending December 4, was 423,200 tons, and from January 1, 18,499,284 tons. The production for the corresponding week of 1874 was 353,737 tons, and from January 1, 1874, 18,762,521 tons. From the above figures it will be seen that there was an increase in the production of last week, as compared with the corresponding week of 1874, of 69,463 tons. There has been a decrease since January 1, as compared with the corresponding period of 1874, of 263,237 tons.

British Exports.—The following quantities of coal were exported from Great Britain to the countries named, for the ten months ended 1874, and the corresponding period of 1875:

	1874.	1875.
United States	103,617	75,718
South America	804,811	816,920
West Indies	228,848	163,785

The shipments to New York this year show a decrease of 1683 tons as compared with 1874, and San Francisco, 19,070 tons.

Bituminous.

The demand for bituminous coal is not so good as a few weeks past, but it compares very favorably with past years. Prices rule as they have for a long time. Several of the companies have already stopped shipments via the Chesapeake and Ohio Canal, and all shipments will probably end with this week.

The Cumberland Companies all appear to comprehend the situation, for it is said that the demand for a reduction of wages is likely to be a general one. As we have stated previously, the competition from the Central Pennsylvania coals, and the probable effort to be put forward by the anthracite companies to regain that portion of the manufacturing trade which they lost during the past season, makes it a necessity for the Cumberland Companies to introduce every economy possible, if they would hold, even their own, during 1876. Any attempt to thwart this move for a reduction of wages will have an unpopular reception from those who look to the best interests of the region.

Freights.

Vessels are scarce at Baltimore and Georgetown, and rates have advanced. At Philadelphia and here, rates are easier, with but small inquiry for vessels.

Wholesale Prices of Anthracite Coal for Dec. f.o.b. at the Tide Water Shipping Ports per ton of 2240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
*Lackawanna and Scranton at Rondout and Hoboken	5 05	5 15	5 25	5 65	6 10	4 95
¶Pittston at Newburgh	5 05	5 15	5 25	5 65	6 10	4 95
Wilkesbarre at Port Johnston	5 05	5 15	5 25	5 65	6 10	4 95
Plymouth, R. A., *Ael*	....	....	5 25	5 65	6 10	4 95
Susque. Coal Co. at Amboy W.A.	5 05	5 15	5 25	5 65	6 10	4 95
Kingston at Hoboken	5 05	5 15	5 25	5 65	6 10	4 95
Lehigh Coals.						
Old Company at Port Johnston	5 55	....	5 55	5 65	6 10	5 10
Old Company's Room Run "	5 55	....	5 55	5 65	6 10	5 10
§Sugar Loaf, Hobok. &Amb."	5 55	....	5 55	5 65	6 10	5 10
Lehigh Coal Exchange "	5 55	....	5 55	5 65	6 10	5 10
Honey Brook Lehigh	5 55	....	5 55	5 65	6 10	5 10
Spring Mt. C. Co. at Hoboken	....	....	....	....	....	....
Beaver Meadow at South Amboy	5 55	....	5 55	5 65	6 10	5 10
†**Schuylkill Coals at Port Richmond.**	‡					
Schuylkill white ash	4 55	4 65	4 75	5 15	5 60	4 45
Schuylkill red ash	...	....	5 05	5 25	5 65	4 45
Shamokin white and red ash	....	....	....	5 40	5 80	4 50
Lorberry	....	....	5 90	5 90	5 90	4 65
Lykens Valley	....	....	6 50	6 50	6 50	5 50

Per ton.

Freight from Hoboken and Weehawken to New York.... 40c.
" " Elizabethport & Port Johnston to N. York. 45c.
" " South Amboy to New York.... 50c.

*Freight on Lackawanna coal from Rondout to New York, by boats or barges of the D. and H. Canal Co. 50c. per ton, the expense of towing vessels from New York harbor to Rondout and back will be borne by the Company.

† Freight from Port Richmond to New York (free of discharging) 85c. per ton.

‡ Prices to the Trade.

§ By Canal at New York, Jersey City and Brooklyn, 30c additional alongside.

Schuylkill coal is delivered f.o.b. of boats in New York harbor at 50c. per ton additional to these rates.

¶ These rates are nominal.

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Penn. at Greenwich, Philadelphia	$5 20	$6 50
" " at S. Amboy	6 00	6 50
Red Bank Cannel Pa. at Philadelphia	8 00	8 50
" " South Amboy	8 50	....
" Orrel	6 00	6 50
Youghiogheny, Waverly Co., at Balt	5 00	6 50
Despard, West Va.	5 00	6 50
Murphy Run, West Va., at Baltimore	4 75	6 50
Fairmount, West Va., " "	4 75	6 50
Newburgh Orrel, Md. " "	4 75	6 50
Cannelton Cannel, W. Va., at Richmond	9 50	11 00
" Splint, " "	5 00	6 50
Peytona Cannel, " "	9 50	11 00
Straitsville " at Sandusky, O	3 25	10 00

Foreign Gas Coals.

	Sterling.	Am. cur'cy.
Newcastle, at Newcastle-on-Tyne	10/6@12/9	6 50@ 7 00
Liverpool House Orrel, at Liverpool	26/	13 00
Ince Hall Cannel "	47/	18 00@20 00
" Gas Cannel "	32/ 6d	13@14
Scotch Gas Cannel, at Glasgow, nominal	25/	7 50
	Gold.	
Block House, at Cow Bay, N. S	2 00	5 50
Caledonia, at Port Caledonia	1 75	5 25
Glace Bay, at Glace Bay	1 80	5 50
Lingan, at Lingan Bay	1 75	....
Sydney, International and Reserve mines, at Sydney	2 00	5 50
Picton, Albion & Vale mines, at Picton	2 25	5 75

Steam and House Coals.

Broad Top, at the mine, $1 25; at Amboy	4 75@5 00	5 25@5 50
Cumberland, at Georgetown and Alexandria, Va	4 00@4 25	5 25@5 50
Cumberland, at Baltimore	4 25@4 35	5 75@6 00
Clearfield and Allegheny, "Kittanning," "Sterling," "Sonman," and "Eureka," at the mines, 90; at Greenwich, Phil	4 25	5 65

Retail Prices in New York.

Anthracite.

Per 2000 lb.	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard	$6 20	$6 40	$5 60
Lackawanna coal, delivered	6 75	7 00	6 25
Wilkes-Barre, "	7 00	7 25	6 75
Lehigh & Locust Mountain, del'd	7 00	7 50	6 50
Schuylkill Red Ash, del'd	7 00	7 50	

The Cost of delivering Pittston coal ranges from 40 cts. to $1 per ton, according to distance from the yard.

Williamsburgh, N. Y.
Lackawanna Coal at Yard.

Stove	$6 40
Egg	5 90
Chestnut	5 40

Bituminous.

Liverpool House Orrel, delivered, per ton of 2000 lb	$23 00
Liverpool House Cannel " " " "	25 00
American " " " "	16 00
American Orrel " " " "	12 00
Red Bank Cannel " " " "	14 00
Cumberland " " " "	7 00

Baltimore, Md. Dec. 7, 1875.

Reported by our Special Correspondent.

No change to note this week.

Boston. Dec. 7, 1875.

Reported by our Special Correspondent.

CARGO PRICES TO TRADE.

Lingan coal	$ 5 20	Westmoreland and Penn.	6 85
Caledonia	5 00	Waverly Co. Youghiogh'y.	6 80
Pictou	5 60	Cannelton Cannel	11 60
Block House	5 20	Cumberland	5 80@ 6 00
Red Bank Cannel	9 00	Anthracite	.6 50@ 7 25
Glace Bay	5 00	" retail	.7 50@ 8 00
Sydney	6 25		

Buffalo, N. Y. Dec. 7, 1875.

Reported by our Special Correspondent.

Prices remain the same.

Chicago, Ill. Dec. 7, 1875.

Specially reported by Messrs. RENO & LITTLE, Coal Merchants.

Retail prices per ton of 2000 lb. delivered to buyer.

No change in prices of coal. Trade very quiet.

BITUMINOUS.

Lehigh Lump	$10 50	Briar Hill and Erie	@ 7 00
Lehigh grate and egg	10 50	Walnut Hill, Pa	@ 6 50
Lehigh stove and chest	11 00	Midway, Pa	@ 6 50
Lackawanna, Wilkes Barre and Pittston*		Cannel	@ 8 00
		Blossburg	7 50
Grate and egg	9 50	Indiana Block	6 00
Stove and chestnut	10 00	Hocking "Brooks"	6 50
		Wilmington and Illinois	5 00

* 50 cents off these prices for car load lots to country dealers and manufacturers.

Cincinnati, O. Dec. 7, 1875.

Reported by our Special Correspondents.

Per ton of 2000 lb.	Bush.	Ton.
Youghiogheny, or Pittsburgh, afloat	10 c.	——
Pomeroy coal	8 c.	——
Kanawha "	10 c.	——
Cannel coal, according to quality	——	——
Semi-Cannel	——	——

The following are the retail prices delivered

Youghiogheny	15@16c. $4 00
Pomeroy	11c. 3 00
Cannel	—c. ....
Kanawha Semi-Cannel	13c. 3 60
Anthracite	9 50@10 50
Foundry coke	10c. ——
Coke, hard and soft	10c. ....

Cleveland, O. Dec. 7, 1875.

Specially reported by Messrs. WARNER, BATES & CO.

No change.

Detroit, Mich. Dec. 7, 1875.

Specially reported by Messrs. ROBINSON & KEYS, Dealers in all kinds of coal.

Per ton of 2000 lb.

Lehigh Lump, per ton	$10 50	Blossburg	8 50
Lehigh " prep.sizes	10 00	Briar Hill	7 50
Wilkes-Barre, Grate and Egg	9 00	Willow Bank	7 00
		Erie	8 00
Wilkes-Barre, Stove and Nut	9 50	Massillon	7 00

Erie, Pa. Dec. 7, 1875.

Reported by our Special Correspondent.

Wholesale, per ton of 2000 lb. Bituminous f. o. b.

Briar Hill lump	$3 75	Beaver lump	$3 50
Midway	3 25	Cat Fish	3 00

Indianapolis, Ind. Dec. 7, 1875.

Specially reported by Messrs. COBB & BRANHAM

No change in prices.

Louisville, Ky. Dec. 7, 1875.

Specially reported by Messrs. BYRNE & SPEED.

WHOLESALE.

per bushel		per bushel	
Pittsburgh	10c	Pine Hill	—
Raymond City	9c.	Kentucky	—

RETAIL.

per bushel		per bushel	
Pittsburgh	14c.	Peytona Cannel	20@22c.
Raymond City	13c.	Buckeye "	—
Pine Hill	13c.	City-made Coke	11c.
Kentucky	12c.	Anth., per ton,	$10 00 to 10 50
Screened Pittsburgh per load			$3 00
Screened Raymond City			2 75
Pine Hill (Kentucky)			2 75
Cannel			$5 to 5 50

Milwaukee, Wis. Dec. 7, 1875.

Specially reported by Messrs. R. P. ELMORE & CO.

Retail price per ton of 2000 lb.

Lehigh Lump	$10 00	Briar Hill, select	$8 00
Lehigh Prepared	11 00	Blossburgh	8 00
Lackawanna (all sizes)	10 00	Cannel	8 00
Pittston	10 00	Pittsburgh	7 00
Scranton	10 00	Steam coal	5 00

New Orleans, La. Dec. 5, 1875.

Specially reported by Messrs. P. & R. DE VERGES, Wholesale and Retail Dealers in Pittsburgh, Anthracite, Cannel and other Coals.

No change in prices.

Pittsburgh, Pa. Dec. 8, 1875.

COAL.—The coal trade has been comparatively quiet during the past week, and presents but little that is really new; the most important feature we have to record is that the river is again in good navigable condition, and the indications are that about all the coal ready to move will get out on the present water. The shipments in November are said to have been the largest ever made in a single month, estimated in round numbers at 1,800,000 bushels, and while coal here has been very much reduced, the stocks in the down river markets have been correspondingly increased. However, prices are maintained; our merchants, as noted at the time, fixed the price afloat at Cincinnati at 9c. per bushel, and they are still adhering to it—it is said there is no margin for profit at anything less. The price here in barges may be quoted at 5c. A number of miners are out on strike, and operators generally, from what we can learn, would prefer stopping for a few months in order to reduce the visible supply.

COKE.—There is a fair degree of activity in this important article all that can reasonably be expected in view of the continued depression in the pig iron trade. The shipments by river within the past few weeks have been large, and the stock afloat is considerably reduced; quotable in boats delivered at wharf at 6c. per bushel. The great bulk of that shipped out by river was placed on former contract. Shipments by rail continue about all that can be expected under existing circumstrnces, but it is complained that there is little or no margin for profit at current rates; quotable at $2 50@$2 75 per ton delivered free on cars in Pittsburgh.—*American Manufacturer.*

Richmond, Va. Dec. 6, 1875.

Specially reported by S. H. HAWES, Dealer in Coal.

Per ton of 2240 lb., f.o.b.

Kanawha Cannel	$12 00	New River Bituminous	$4 50
" semi-Cannel	4 75	Clover Hill Coal	4 25
Coalburgh Splint	4 75	James River Bitum	3 30
Lewiston "	4 75	" " Carbonite	5 80
Kanawha Gas coal	4 50		

San Francisco.

From the *Commercial Herald*, Nov. 25, 1875.

Imports from January 1st to Nov. 16:

Anthracite tons	11,571	English, tons	53,582
Australian, tons	121,601	Vancouver Island, tons	51,617
Coos Bay, tons	29,217	Rocky Mountain, tons	53
Cumberland, tons	8,530	Seattle, tons	55,761
Mt. Diablo, tons (8 mos)	121,059	Bellingham Bay, tons	9,545

By the steamer *Mikado*, from the Colonies, we have late mail advices from Newcastle, etc., Sydney dates to Oct. 23, are at hand per steamer. There were no vessels loading coal for this port, although during the previous four weeks five had sailed from Newcastle with 8,400 tons, leaving three on the berth. The rates of freight were 16@18/, which owners declined to accept. It is probable that some of the vessels in port at New South Wales will load for this port upon owners' account. At this writing there are one or two spot cargoes of Sydney afloat—(new mines), not well known, that can be purchased at our inside rates, yet for well known lots of Wallsend full rates are obtainable. Some anxiety is felt by reason of the non-arrival of the ship *Itasca*, now out 215 days from Baltimore, with Cumberland coal. Imports during the current week embrace the following cargoes: Bark *Arkwright*, from Naniamo, 1,970 tons; *Empire*, Coos Bay, 500 tons; *Germania*, 1,400 tons Bellingham Bay. The market is still sluggish for all Bituminous; late cargo sales of Liverpool were made at $8 50, and the same rate is asked for Sydney. Wallsend cargoes may now be quoted at $9@9 25; Sydney, $8 25@8 50@9; Cumberland in bulk, $14@15; casks, $16@18; Bellingham Bay, at $8 50; Coos Bay, $10; California Mt. Diablo Steam, $6 25@8 25 for fine and coarse respectively; English and Scotch Steam $9@10; Nanaimo, $9 50@10; Seattle, $9 25@10; Anthracite, $15@18. From statistics given by us last week exclusively, it will be seen that the home supply of Mt. Diablo mines shows a falling off for ten months of the current year as compared with 1874, of more than 47,000 tons. It is possible, however, that the production and interior consumption may make good the deficiency. The ship *R. B. Fuller*, from Liverpool, brings 1,004 tons.

Toledo, Ohio. Dec. 7, 1875.

Specially reported by Messrs. GOSLINE & BARBOUR.

Per ton of 2000 lb. on cars.

Hocking Valley	$3 40	Massillon	4 00
Straitsville	3 40	Youghiogheny	5 00
Shawnee	3 40	Blossburg	7 00@7 50
" nut	2 90	Cumberland	7 00@7 50
Briar Hill	5 50	Connellsville coke	7 00

ANTHRACITE.

Grate, screened	$7 50	Stove, screened	$7 75
Egg, "	7 50	Chestnut "	7 50
Lehigh Lump	9 00		

40 cents to $1 per ton additional for delivery at retail.

Toronto, Ont. Dec. 4, 1875.

The following are present retail prices for coal:

Per ton all sizes.

Lackawanna and Scranton	$7 00
Lehigh Lump and prepared	8 00
Blossburgh	6 50
Soft lump for grates	6 00
Soft nut	4 50

Halifax, N. S. Dec. 4, 1875.

Prices per ton of 2240 lb. in gold.

Sydney (old mines)	$4 00	Little Glace Bay	3 35
Gowrie	2 35	Blockhouse	3 35
Victoria	——	Albion (at Railroad)	4 00

Rates of Transportation on Anthracite Coal to Tide Ports.

Lehigh and Wyoming Coals. per ton of 2240 lb.	From Penn Haven.	From Mauch Chunk.	From Hazleton**		From Upper Lehigh.		From Ashley and Sugar Notch.	
To ‡ Newark, N. J., via Central Railroad of New Jersey	2 60	2 46	2 93		2 93		3 16	
‡ Mauch Chunk, Pa., via Central Railroad of N. J.	14	..	56		47		71	
‡ Philipsburg, N. J.	99	85	1 32		1 32		1 65	
Elizabethp't, Port Johnston, Hoboken and South Amboy, N. J., shipping and wharfage 35c. add.	2 24	2 10	2 59		2 57		2 80	
High Bridge, N. J.	2 40	1 95	2 80		2 54		2 72	
Somerville and Raritan, N. J.	2 80	2 35	3 20		2 35		3 12	
Elizabeth, Cranford, Westfield & Elizabethport, for consumption,	2 60	2 46	2 95		2 93		3 16	
¶ Jersey City, N. J., and New York, via L. V. RR. and Morris Canal.	2 85	2 40	3 17		3 24		3 54	
Andover, via Delaware, Lackawanna and Western RR.	3 30	3 10	3 70		3 69		3 99	
Trenton, Somerset Junction and Greensburg, via P. RR. Belvidere Division	2 65	2 45	3 05		3 04		3 34	
Trenton, for shipment, including shipping and wharfage	2 11	1 95	2 45		2 46		2 76	

From *Mauch Chunk* to *New York* (towing limits) and ersey City† via Lehigh Valley RR. and Morris Canal... $2 37

From *Mauch Chunk* to *Philadelphia* via L. V. RR. and North Penn. RR 1 75

††From *Phillipsburg, N. J.* to *Hoboken* for shipment via Delaware. Lackawanna and Western RR., Morris and Essex Division 1 24

From *Lackawanna Junction* to *Auburn, N. Y.*, for shipment, via Southern Central R.R. in connection with Pa. and N. Y. R.R. 2 53

From *Lackawanna Junction* to ‖*Weedsport* for *Rochester and Charlotte* 2 59

From *Lackawanna Junction* to *Sterling* for *Oswego, N.Y.*.. 2 62

‖ To this point for all places between Rochester and Buffalo the rate is 2 53

* The rate to this point for Syracuse is 2 08

** Rates on line coal from Hazleton are 10c. per ton above these figures.

‡ The cost of unloading is to be added to these rates. No charge less than 40c. per ton will be made for any distance. Tolls from Mauch Chunk to Phillipsburg for way points will be $1 15 per ton.

§ Twenty cents per ton less when five cars at a time to one party. Provided that where the reduction makes the rate $1 a ton, or less, the rate will be $1.

¶ 20 cents per ton additional for transferring coal from boat to boat, and 30 cents per ton for reshipment of same from wharves.

† Transportation on Coal destined for re-shipment from this point is 20c. less than above rate.

†† The rate for consumption to this point is $1 80.

Schuylkill Coals. per ton of 2240 lb.	From Pine Grove	From Tamaqua.	From Port Carbon.	From Mount Carbon.	From Schuylkill Haven.
To *Port Richmond*, for shipment, via P. & R. R. R., Main Line	2 12	2 07	2 00	1 99	1 92
Philadelphia, Retail yards	2 22	2 17	2 10	2 09	2 02
Harrisburg, via Lebanon Valley Branch	1 35	2 02	1 95	1 94	1 87
Allentown, via East Pennsylvania Branch	1 70	1 65	1 58	1 57	1 50
Lancaster, and Points on Lancaster Branch, via R. & C. R.R	1 82	1 77	1 70	1 69	1 62
Dauphin, via Schuylkill and Susquehanna Branch	85	....	1 43	1 42	1 35
Slatedale Junction via Berks and Lehigh Branch	1 88	1 83	1 76	1 75	1 68
Lebanon, via Lebanon and Tremont Branch	96	....	....	....	....

From *Tamanend* to *Catawissa*, via Catawissa and Williamsport Branch Railroad 94

From *Tamanend* to *Williamsport*, via Catawissa and Williamsport Branch Railroad 1 39

* From *Port Clinton* to *Philadelphia* via Schuylkill Canal, including freight and charges for the use of cars and barges, and for tolls (exclusive of cost of unloading)... 1 69

* From *Port Clinton* to *New York*, within towing limits, " 53d street 2 71

For shipment via Main Road or Schuylkill Canal, one and one-half cents per ton per mile, and two cents per ton additional, to Port Carbon, Mount Carbon, Schuylkill Haven, Pine Grove, Tamaqua, or Port Clinton, for Canal, as the case may be.

Coal sent to points on the Catawissa and Williamsport Branch will be charged one and one-half cent per ton per mile, and two cents per ton additional to Tamanend.

The rates of freight and tolls on lump and steamboat coal (except that sent to Richmond for shipment) will be twenty per cent., and on broken coal will be ten per cent. less than the above rates.

* The charge from Schuylkill Haven to Philadelphia or New York is 11c. additional to these rates.

On and after July 15th, the Drawback of ten cents per ton now paid on shipments of Anthracite Coal from Schuylkill Haven and Port Clinton, that have passed Fairmount Locks to Philadelphia and vicinity, will be discontinued.

CANAL TOLLS, exclusive of towage, Bordentown to New Brunswick, when towed by the Company's Steam Tugs:

For Anthracite Coal ..... 3½c.

Bituminous and Semi-bituminous Coal... 3½c.

Freights on Bituminous Coals from the Mines to Tide-Water Shipping Ports.

From the Mines to Cumberland and State Line (say an average of 20 miles) the charge is 3 cents per ton of 2240 lb. per mile.

From State Line to Amboy (346 miles) $3 75 per ton of 2000 lb. On coal shipped beyond this point there is a drawback of 50 cents per net ton.

From Cumberland to Baltimore (178 miles) $2 31 per ton of 2240 lb., or $2 02 per net ton, and 4 cents per gross ton for use of cars.

From Cumberland to Georgetown (152 miles) by canal, $1 15. Tolls, 51 cents.

From the Mines to Piedmont (from 4 to 10 miles) 5 cents per ton of 2240 lb. per mile on distances less than 5 miles, and 4 cents per ton per mile on distances not over 10 miles.

From Piedmont to Baltimore (206 miles) $2 69 per ton of 2240 lb., or $2 40 per net ton.

From any point in the Kanawha Valley to the James River wharves below Richmond, (say 250 miles) by C. and O. R.R., including terminal charges, per ton of 2240 lb. For Cannel coal, $4 50.

Do. do., for Semi-Cannel or Splint, per ton of 2240 lb., subject to rebate on shipments of 5000 tons or more, $3 65.

From Irwin to W. Phila (say 332 miles) per P. R R. Penn. Westmoreland gas coal, per ton 2000 lb. $4 75

From Osceola to W. Phila (say 248 miles) per T. & C. R. R, per ton bituminous coal of 2000 lb., 6c. extra for cross roads. Drawbacks, according to destination of coal 3 55

From Fairmount and Clarksburg to Baltimore (say 300 miles) via B. & O. R. R. including loading, per 2000 lb 4 75

On through coal after deducting drawback ....

From Richmond, Va., to New York, via vessel, 392 miles per 2240 lb.. 1 60

" " " *Boston*, about 650 " " " 2 00

" " " *Philadelphia*, 292 " " " 1 25

From the Mines to Richmond, via James River and Kanawha Canal, 15 miles 15

Freights.

Per ton of 2240 lb.

Representing the latest actual charters up to Dec. 9, 1875.

PORTS.	From Philadelphia.	From Baltimore.	From Georgetown.	From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.¶
Augusta, Me.	....	2 40	....	....
Albany	*85	1 70	....	....
Amesbury, Mass.	....	....	....	....
Bangor, Me.	†2 00	3 00	....	1 75
Bath, Me.	1 60	2 50	2 90	1 30
Baltimore	....	....	....	....
Boston, Mass	§2 00	2 50	2 50	1 90
Bridgeport, Ct	*85	1 65	2 00	90
Bristol, R. I.	....	....	2 00	90
Cambridgeport, Mass.	§1 90	....	2 70	1 60
Derby	....	1 65	....	....
Dighton	....	1 70	....	....
East Cambridge	1 90§	....	2 75	§1 55
Fall River	1 50	1 65	....	90
Hackensack	....	....	....	....
Hallowell, Me.	....	....	....	....
Hartford	....	1 65	....	1 40
Hoboken	†85	1 40	1 60	40
Hudson	....	1 65	....	....
Jersey City	....	1 40	1 60	40
Lynn, Mass.	†2 10	....	....	†2 60
Middletown	....	....	....	1 15
Mystic	....	....	....	....
Newark	....	....	....	....
New Bedford	1 50	1 80	2 10	90
Newburyport	2 10	2 40	2 75	1 75
New Haven	*85	1 65	2 00	90
New London	1 50	1 70	2 00	95
Newport	1 50	1 65	2 00	90
New York	85††	‖1 60	1 70	40
Norfolk, Va.	85	60	60	....
Norwalk	85‡	1 30	2 00	80
Norwich	1 50‡	1 70	....	90
Pawtucket	1 75‡	1 65	2 10	‡100
Philadelphia	....	80	....	....
Portland	1 95	2 25	2 70	1 60
Portsmouth, N. H.	2 05@2 10	2 35	2 90	1 75
Providence	1 50	1 70	2 00	90
Petersburg, Va	....	90	....	....
Portsmouth, Va.	....	....	....	....
Poughkeepsie, N. Y.	....	1 50	....	....
Richmond, Va.	1 00	70	....	....
Rockport	....	....	....	....
Saco	2 50	....	....	....
Sag Harbor	....	....	....	1 00
Salem, Mass.	2 00	2 30	2 80	1 30
Salisbury Pt., Mass.	....	....	....	1 50
Savannah, Ga.	....	1 50	....	....
Stamford	*85	....	....	90
Stonington	....	....	....	....
Taunton	.. ..	..	....	1 30
Trenton, N. J.	....	....	....	....
Troy	...	....	....	....
Warren, R. I.	....	....	....	90
Washington, D. C.	1 00	....	....	....
Wareham	....	1 75	2 10	....
Weymouth	2 00	2 25	2 75	....
Wilmington, Del	....	85	....	....
Wilmington, N. C.	....	1 50	....	....

* And discharging and towing. † And discharging.

‡ And towing. § 3c. per bridge extra.

‖ The rate to this point by barge is $1 70. †† Afloat.

From Philadelphia to all places on the Hudson River the rate is 85c., and discharging and towage according to destination.

¶ These rates are very irregular and our quotations may be considered nominal.

THE BRITISH COAL AND IRON TRADES.

LONDON, November 27, 1875.

THE IRON TRADE.

No general improvement is observable in either the pig or manufactured iron trades. In the North of England several furnaces are about blowing out; about a dozen finished-iron works have suspended operations entirely; while but very few of the remaining ones are working more than half time. Much distress is anticipated to fall on several thousand workmen who are likely

to be without employment during the winter months. The prospects for Wales are no more encouraging than those of the Northern country. In the South Staffordshire district the works are fairly employed, and sufficient orders are anticipated to keep them going, at the present rate, during the balance of this year. There is some revival in the Barrow-in-Furness district, but it is confined to the steel interests. Sheffield railmakers say that they cannot procure for their rails the cost of production, as makers in Wales and Cleveland are undersselling them by 15 per cent.

The following are the leading quotations of iron :

——	Tees, f.o.b.	Barrow, f.o.b.	Liverpool, on trucks.
No. 1 Pig	54/	*80/	70/6
No. 2 "	51/6	*77/6	
No. 3 "	49/6	*75/	68/
No. 4 Forge.....	49	71/6	65/
Common Bars..	142/6@145/		152/6@160
Rails.....	130/@135/		140/@145/

* Bessemer Pig.

Common bars in South Staffordshire, £85, and marked bars, £10. Iron rails in Wales, £6 10/@£6 15/, and bars £7 5/. Steel rails, £9@£9 10/. Steel rails at Liverpool and on the East Coast, £9 10/@£10 10/.

THE COAL TRADE.

The demand for coal is confined mostly to house and gas descriptions, other sorts being as dull as they have been for months. The great depression in the iron and general manufacturing industries gives but little hopes of an early improvement in the demand for such fuel as they consume. Type coals are quoted f. o. b. as follows : steam, 10/6d.@14/ ; households, 11/@15/ ; and gas coals, 8/6d.@10/. Hetton gas coal f. o. b. Sunderland, is quoted at 20/6d. ; common steam coal f. o. b. Liverpool, 10/ ; South Wales coals f. o b. Cardiff, as follows : best double screened coal, 12/9d. ; colliery screened, 11/3d.@12/ ; household, 10/ ; coke, 14/6d.@16/.

THE LABOR MARKET.

Notices of the termination of existing contracts in South Wales are to be posted up on the 1st of December. The Board of Conciliation has adopted a form of agreement to bind both masters and men to accept the decisions of the joint committee or the umpire. It is intended that this agreement shall be signed by every individual workman as well as by all the colliery managers, and in aid of this the men's committee have issued a manifesto, recommending its acceptance without delay. The agreement can only be terminated by six months' notice on either side. The work of the Board is progressing very satisfactorily, and a sliding scale offering justice to both the colliery owners and the men is likely to be arranged.

The Durham County Miners' Association at late meetings when there were present representatives of over 40,000 men, resolved to refer to arbitration the question of a reduction of 20 per cent. in wages.

The Miners' National Union has just issued a circular from which it appears that there are enrolled over 146,000 members, representing sixty-one mining districts.

The question of a reduction of 20 per cent. from the wages of the Northumberland miners' has been referred to arbitration.

SCOTLAND.

PIG IRON.

Prices are nominally unchanged. Considerable sales are being made from the works, and stocks in store are being reduced. Warrants have ranged, during the week, from 60/ 10½d. to 62/ 1½d. and closed yesterday at 61/ 9d. The stock in CONNAL & Co's stores, yesterday, was 66,294 showing a decrease of 1441 tons during the week. The shipments, both foreign and coastwise, for the week ending Nov. 20, show a decrease of 2821 tons as compared with the corresponding week of 1874. The shipments from Dec. 25, however, show an increase of 83,382 tons as compared with the corresponding period in 1873-4. Makers' No. 1 brands are quoted as follows: Gartsherrie, 72/ 6d. ; Coltness, 77/ ; Summerlee, 70/ ; Langloan, 73/ ; Glengarnock, 68/ 6d. ; and Eglinton 63. Freights are as follows; To New York, 5/ ; Boston, 14/ ; New Orleans, 5/ ; Baltimore, 8/ ; Philadelphia 10/ ; and San Francisco, 27/ 6d. The finished iron trade is dull. Common bars have been reduced to £7 10/.

THE COAL TRADE.

Steam coal is in better request and prices have advanced 6d. per ton. Household coal is not so active as it has been, but prices are maintained. Other qualities are dull. The following are the wholesale quotations: Household coals 9/@11/ 6d. ; steam, 8/9d @11/ ; Wishaw Main, 7/ 3d.@8/ ; splint, 8/ 3d.@9/ ; and smiths, 14/.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, Dec. 10, 1875.

American Pig.—The demand for this article is more quiet than for several weeks back, although there are constantly small lots being sold. We are reported sales of 600 tons of No. 1, and 300 tons of No. 2 Thomas, and 500 tons of Pequest, a mixed lot. The latter is reported to have sold at a very low figure. Stocks of iron are reported to be much larger than a year ago, and there have not yet been any announcements of furnaces to blow out in January. We quote: No. 1 foundry at $23 ; No. 2, $21 @$22 ; and forge at $19@$21.

Scotch Pig is very firm, with business mostly confined to small parcels. We note sales of 50 tons of Eglinton, at $30, and 150 tons of Coltness on private terms. Quotations are as follows : Eglinton, $29 50@$30 ; Coltness, $32 50@$33 ; and Glengarnock, $31.

Rails.—There is no further business reported, and in the absence of the same, we quote as follows : Iron rails at mills, $42@$47, and steel at $65@$70. We have heard of one quotation of iron rails at $42, while some Western mills quote as high as $50.

Old Rails.—There is nothing doing in these, which are nominally quoted at $25, with but a small quantity offering.

Scrap is very quiet, and quoted at $30@$31.

Baltimore. Dec. 8, 1875.

Specially reported by Messrs. R. C. HOFFMAN & Co.

We have no change to report in our iron market, and continue last quotations :

Baltimore Charcoal....$32@35		Anthracite No. 3.....$21@22	
Virginia Charcoal.....	30@34	Mottled and White....	18@20
Anthracite No. 1.....	25@26	Charcoal C. B. Blooms,	70@75
" No. 2.....	23@24	Refined Blooms.....	60@65

Boston. Dec. 4, 1875.

PIG has had a dull week again. The reports of failures and extensions of two or three prominent Western founderies have made holders much more conservative in their offerings, and the market, wanting hammering for sales, settles now into its apparently normal condition, which is dullness. The reports that come to us from New York, on sales and quotations, are somewhat conflicting, yet there is no reason to doubt but that the best brands of No. 1 are obtainable at $24. No. 2 at $22, and gray forge at $18@$19; and, even, on these some leading buyers are confident of shadings. The announcement to be seen in the old-iron report of the new consumers of gray forge will be an item of encouragement to that line, and suggests an opportunity now for heavy holders to find a new line of prompt cash customers. The market values here are nominally for No. 1, $24@$26; No. 2, $22@$24 ; gray forge, $19@$21.

BAR is without improvement. The demand is small, chiefly from blacksmiths, this week, while the prices hang at $55@$57 for refined, and $51@$53 for common.

STEEL is moving in a small and steady way. The series of tests which the Nicholson File Company are making, to determine the true worth of the various brands of steel and of files, is about completed, and begins to attract great attention.

We quote American tool, 14@15c. ; American machinery, 9@9½c. ; Bessemer tires, 6¾@7¼c. ; SWEET'S Excelsior Tire, 8½@12c. ; English tool, 16@18c. gold.

OLD IRON moves along in the same rut marked for the past two months. Wrought iron sells as fast as received, but the receipts are very light indeed. This is a very fortunate circumstance, for the market is not likely to consume quite as much as it has done, as one of the very largest buying companies, the Quinsigamond, are putting in eight furnaces to work pig iron. The Norway have turned almost exclusively to pig, and one of the nail furnaces is likely very soon to make pig its chief consumption. Whether the small quantity of wrought scrap made, the idleness of blacksmiths, etc., will offset this decreased consumption of scrap, is a question. Two of the large dealers here are storing, refusing to consider any offer of less than $1 40. Cast iron is positively dead, and our quotations are nominal.—*Commercial Bulletin.*

Cincinnati. Dec. 7, 1875.

Specially reported by Messrs. TRABER & AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

We have no change to report in our pig iron market. Below please find closing quotations :

CHARCOAL.

Hanging Rock, No. 1 Foundry.....	$25 00@26 00	—4 mos
" No 2, "	23 00@24 00	—4 mos
" Mill	22 00@23 00	—4 mos
Tennessee No. 1, Foundry.....	24 00@25 00	—4 mos
Tennessee, No. 2, "	23 00@23 50	—4 mos
" Mill.....	22 00@23 00	—4 mos
Missouri, No. 1, Foundry.....	@	—4 mos

STONE COAL.

Ohio, No. 1, Foundry.....	23 00@24 00	—4 mos
" No. 2, "	22 00@23 00	—4 mos
Ohio Mill.....	22 00@	—4 mos
Missouri, No. 1 Foundry	27 00@28 00	—4 mos
" No. 2, "	26 00@27 00	—4 mos
" Mill.....	26 00@27 00	—4 mos

CAR-WHEELS.

Hanging Rock, C. B.....	40 00@50 00	—4 mos
Tennessee "	30 00@35 00	—4 mos
Missouri "	30 00@40 00	—4 mos
Alabama "	30 00@35 00	—4 mos

BLOOMS.

Charcoal.....	60 00@ 70 00	—cash

SCRAP IRON.

Cast.....	60c.@ 75	—cash
Wrought.....	1 00@1 25	—cash

Chicago. Dec. 7, 1875.

Specially reported by Messrs. ROGERS & Co., dealers in Scotch and American pig iron.

No. 1 Coltness.....	$40 00@ ....
No. 1 Gartsherrie.....	40 00@ ....
No. 1 Summerlee.....	38 00@ ....
No. 1 Glengarnock.....	37 00@ ....
No. 1 Eglinton.....	36 00@ ....
Warner's "American Scotch"	34 00@ ....
Massilon No. 1 Foundry	31 00@ ....
No. 1 Grand Tower Mo. ores (Bituminous)	29 00@ ....
No. 2, " " "	28 00@ ....
No. 1 Mill..	25 00@ ....
No. 1 Foundry, Ohio.....	28 00@ ....
No. 2 " "	27 00@ ....
No. 1 Hanging Rock (charcoal)	30 00@ ....
No. 2 " "	24 00@ ....
Union "A" 1 (Anthracite).....	28 00@ ....
Union "B" 1 (Anthracite).....	26 00@ ....
No. 1 Lake Superior (charcoal).....	30 00@ ....
No. 2 Lake Superior "	28 00@ ....
No. 3 Lake Superior "	30 00@ ....
No. 4 Lake Superior "	32 00@ ....
Bessemer Steel Rails	72 00@ ....
New Iron Rails.....	50 00@ ...
Old Rails.....	28 00@ ....

Cleveland, Ohio, Dec. 7, 1875.

Messrs. C. E. BINGHAM & Co., quote as follows :

Per gross ton, on four month's time. Subject to change in market. Discount for cash 4 per cent.

FOUNDRY IRON.

No. 1, Lake Superior Charcoal	29 50@....
No. 2, "	29 00@....
No. 1, Anthracite.....	26 50@....
No 2, "	25 00@....
No. 1, Bituminous foundry.....	26 50@ ...
No. 2, " "	25 00@....
American Scotch, No. 1, Cherry Valley.....	29 50@....
" " B—1, " "	27 50@....
" " No. 2, " "	26 00@....
No. 1, Massilon.....	29 00@....
B—1, "	27 00@....
No. 2, "	24 00@....

CAR WHEEL AND MALLEABLE IRON.

No. 3 Lake Superior Charcoal.....	28 50@....
No. 4 " " "	30 00@....
Nos. 5 and 6 " "	30 00@....

BESSEMER IRON,

Nos. 1 and 2 Lake Superior Charcoal.....	29 00@....

FORGE IRON.

No. 1, Gray.....	23 50@....
White and Mottled.....	22 50@...

Indianapolis, Ind. Dec. 7, 1875.

Specially reported by NELSON KINGMAN, broker and dealer in pig iron, etc.

Trade very dull at prices named below.

New Rails at mill.....	$48 00@50 00
Old Rails "	24 00@26 00
Hanging Rock Charcoal Pig No. 1 foundry	28 00@29 00—4 mos
" " " " " 2 "	26 00@28 00—4 mos
" " " " Mill.....	24 00@26 00—4 mos
Car Wheel C. B.....	40 cc, nominal.

STONE COAL.

Indiana No. 1 Foundry pig Red Short ...	24 00@26 00—4 mos
" 2 " " " ...	22 00@24 00—4 mos
" 1 Forge " " ...	....@ ....—4 mos
" 2 " " " ...	....@ ....—4 mos
Ohio No. 1 Foundry pig Cold Short	25 00@26 00—4 mos
" 2 "	24 00@25 00—4 mos
" Mill.....	23 00@24 00—4 mos
" No. 1 Foundry, Neutral.....	26 00@28 00—4 mos
" No. 2 " "	25 00@27 00—4 mos
Merchant Bar	2½c.—3 mos
1st quality C. H. No. 1 Boiler Plates, per lb....	5 c.—3 mos
1st " Com. Sheet for No. 24, W.G. "	4 c.—3 mos
1st " Charcoal Sheet " " "	5½c.—3 mos
Best Bloom Galvanized Sheet, discount 20 per cent	—cash.
2d quality " " " 30 "	—cash.

f. o. b. in Indianapolis.

Louisville. Dec. 5, 1875.

Specially reported by Messrs. GEORGE H. HULL & Co.

The market continues dull, the sales being confined to iron for immediate use. Prices are unchanged. The usual time, four mos., is allowed on the quotations :

HOT BLAST—CHARCOAL.

No. 1 foundry, from Hanging Rock Ores.....	$25 00@26 00
No. 2 " "	23 00@24 00
No. 1, Mill, from " "	—@ —
No. 1, foundry, from Alabama, Georgia and Tennessee ores	23 00@24 00
No. 2, foundry, from Ala., Geor'a and Tenn. ores	22 00@23 00
No. 1, Mill, from " " " " "	21 00@22 00

HOT BLAST—STONE COAL AND COKE.

No. 1, foundry, from Hanging Rock ores.....	23 00@24 00
No. 2, " " " "	22 00@23 00
No. 1, Mill, " " " "	21 00@22 00
No. 1, foundry, from Ala. Ga. and Tenn. ores..	23 00@24 00
No. 2, " " " "	22 00@23 00
No. 1, Mill, " " " "	21 00@22 00
No. 1 foundry, from Missouri ores.....	24 00@25 00
No. 2 foundry, from Missouri ores.....	24 00@25 00
No. 1 Mill, from Missouri ores	25 00@26 00

COLD BLAST—CHARCOAL.

Car Wheel from Hanging Rock ores.....	35 00@40 00
" " Tennessee "	28 00@30 00
" " Alabama and Georgia ores.....	28 00@38 00
" " Kentucky ores.....	28 00@40 00

Milwaukee. Dec. 7, 1875.

The following are the present prices, per ton of 2,240 lb. :—

Frankfort L. S. Charcoal, No 1.		$30 00
" " "	No. 2 & 3.....	28 00
" " "	No. 4 & 5.....	31 00
" " "	No. 6.....	35 00
Mil. Anthracite L. S.,	No. 1.....	30 00
" " "	No. 2.....	28 00
Wisconsin Iron,	No. 1.....	26 00
Mahoning Valley Bit's	No. 1.....	32 00
" " "	No. 2.....	30 00

Pittsburgh. Dec. 8, 1875.

Specially reported by A. H. CHILDS, Esq.

PIG IRON.—There is little that is really new or important to record ; business continues very much depressed, fully as much, if not more so, than at any other time since the panic, and, furthermore, no one expects any change for the better until next month—it is not likely that there will be any decided improvement until the spring trade fairly opens up. Quite a number of the mills will shut down within the next few weeks, as is the custom, to take stock and make repairs—and some of them, it is said, will not start up their puddling furnaces until the outlook for the products present a considerably better appearance than it does at the present. The hitch between the manufacturers and puddlers has not yet been adjusted, but the probability is, if the puddlers do

not agree to accept the reduction demanded by the manufacturers, that a lock-out will be the result, as the latter say there is no other alternative. This being the position of affairs, there is little or no demand for the raw article, as there is very naturally a determination manifested on the part of the mills to buy no more pig than is absolutely necessary to supply immediate necessities; and prices continue easy, although without quotable change as compared with the date of our last report. Notwithstanding stocks are very much reduced, and the production down lower than it has been at any time since the war, the feeling prevails that hard pan has not yet been reached, and some of the "knowing ones" predict that gray forge will go to $20, 4 mos., before a reaction sets in. The future of the market is, to say the least, very foggy, and the fact that operators generally have been so badly deceived in its course during the past year, it is not calculated to inspire much confidence in regard to its course in the immediate future. The receipts from the West, by which we mean the Shenango and Mahoning Valleys, continue light; local furnaces are now able to supply the demand, and it is said that our local furnacemen are able to undersell those west of us, from which it is fair to infer that the cost of production here is less than at the points in question.

QUOTATIONS.

No 1. foundry	$25 00@26 00—4 mos
" 2, "	23 00@24 00—4 mos
Gray forge	22 00@23 00—4 mos
White and mottled	20 00@21 00—4 mos
Charcoal, No. 1 foundry	27 00@29 00—4 mos
Charcoal mill	23 00@24 00—4 mos
Cold blast car wheel, Eastern	30 00@35 00—4 mos
" " Western	40 00@50 00—4 mos

MANUFACTURED IRON.—The general state of the market varies but little, if any, since the date of our last review; trade continues very dull and unsatisfatory, with but little prospect, just now, of any improvement during the next thirty or forty days. The great aim of our manufacturers, ever since the panic, has been to reduce the cost of production, and in this they have been eminently successful; but the margin for profits is less now than it was, as prices have been reduced correspondingly. The only point gained is, that it enables them to successfully meet competition, which they could not have done otherwise. It is claimed by those who are in a position to know, that those mills engaged exclusively in the manufacture of ordinary sizes of merchant iron cannot possibly hold their own, and that but for the fact that nearly all of them have more or less specialties on which they realize a fair margin for profit, a general suspension would have taken place before this. As stated in our last review, it is simply impossible to give quotations, as there is no regularity; there is still a card in existence, but as already intimated, but little attention is paid to it.

RAILS.—There has been nothing done in iron rails here since the Superior mill went to pieces; trade at other points is only fair. It looks as if iron rails were about to be superseded entirely by steel. The Edgar Thompson Co. quote steel rails at $67 per ton cash, of 2240 lb., delivered free on cars at works.

PIG METAL SALES REPORTED FOR THE AMERICAN MANUFACTURER FOR THE WEEK ENDING DEC. 8, 1875.

BITUMINOUS COAL OR COKE, SMELTED FROM L. S. ORE OR L. S. ORE AND NATIVE.

30 tons No. 1 foundry	$25 00—4 mos.
30 tons No. 2 foundry	24 00—4 mos.
10 tons No. 2 foundry	23 00—4 mos.
200 tons gray forge	23 00—cash.
300 tons gray forge	22 50—4 mos.
350 tons gray forge neutral	22 50—4 mos.

CHARCOAL.

150 tons No. 2 foundry, H. R.	$25 00—4 mos.
160 tons various grades	P. T.
60 tons gray forge, Va.	25 00—5 mos.

—*American Manufacturer.*

Richmond, Va. Dec. 7, 1875.

Reported by ASA SNYDER, Esq.

Nothing worthy of note since last quotations. The season's operations have nearly terminated. Sales of about 100 tons the past week. We quote:

Virginia Cold Blast Charcoal Pig Iron	$27 to $33
" Warm " " " "	24 to 28
" " " Coke " " 1 X	24 to 25
" " " " " " 2 X	22 to 23
" " " " " " 3	21 to 22
" Anthracite 1 X	25 to 26
" " 2 X	23 to 24
" " 3	22 to 23

San Francisco, Cal.

From the *Commercial Herald*, of November 25, 1875.

Imports for the week include in part cargo per British ship, *British India*, from Liverpool, of 250 tons pig iron, 1550 boxes tin plate, bar and sheet iron, etc.; the *Mikado*, from Sydney, brought us 299 ingots pig tin, the present price of which is 20c. The steamer from Portland brought down 40 tons Oregon pig iron—present asking price, $37 per ton. We quote the range of the market for pig iron, $32 50@35 50. Tin plate is without movement, quotations nominal. The stock is thought to be large. The supply of Sydney tin is liberal with a limited demand; price, 20c. Banca pig tin is held at $25@26c. The stock of yellow metal is not large, and when suits are required they are ordered from the East by rail. The market for American cast steel is well supplied, and is fast taking the place of best brands of English. The ship, *R. B. Fuller*, has 500 boxes tin plate, for which, at the close, there is an increased inquiry.

St. Louis. Dec. 7, 1875.

Specially reported by Messrs. SPOONER & COLLINS, Commission Agents for all kinds of Iron.

We have nothing new to report regarding the condition of our market. Prices remain low and demand light, and no prospect of a change until after January, 1876. We quote on 4 mos.:

Mo. Stone Coal No. 1 Fy.	$26@27
" " " 2 "	24½@25
" " Gray Mill,	23½@24
" Charcoal No. 1, Fdy.	26@27
" " " 2, "	23½@24
" " Gray Mill,	23@24
Tenn. " No. 1, Fdy.	25@26
" " " 2, "	23@24
" " Gray Mill,	22@23
" Coke, No. 1, Fdy.	25@26
" " " 2, "	23@24
" " Gray Mill,	23@24
H. R. Char. No. 1, Fdy.	26@27
" " " 2, "	24@25
" " Gray Mill,	24@25
Massillon iron, A No. 1	34@35
" " B " 1	32@33
" " " 2	30@31
Cold Bl. Car Wheel, Mo.	32@35
" " " Tenn.	30@32
" " " Ala.	30@32
" " " H. R.	35@40
Mo. Charcoal Blooms	60@65
" Scrap "	60@65
" " hammered Billets	8c@90
Assorted Bar Iron	2 4-10c.
No. 1 Wrought Scrap	1c.
Heavy cast "	¾c.
Light "	½c.

Montreal. Nov. 30, 1875.

We quote pig iron:—Eglinton and Clyde, $21 50; Carnbroe, $22 50; American, $24 to $26; Summerlee and Calder, $23 00 to $23 50; Langloan & Gartsherrie, $23 00 to $23 50; Coltness, $24 00 to 24 50; Hematite, $30 to $31. Bar, per 100 lb., Scotch and Staffordshire, $2 30 to $2 40; best do., $2 55 to $2 65, Swedes and Norway, $5 00 to $5 50; Lowmoor and Bowling, $6 50 to $7 00.—*Monetary Times.*

METALS.

NEW YORK, FRIDAY EVENING, Dec. 10, 1875.

Business in metals is very much curtailed, as is usual at this season of the year. No improvement is anticipated until after the accounts of the buying firms are made up for the year. The little business that might be done from this city is being curtailed by transfers of orders to Boston, where better rates of freight are procurable. Cable advices from London indicate no improvement there but rather the reverse.

ERNEST W. S. MURRANT, ESQ., of London, under date of Nov. 26, says: "Transactions for the week were brought as usual within the narrowest limits, and no disposition to operate was percepticle, although the position of copper, tin and iron, would, in ordinary times, undoubtedly attract much attention."

Gold Coin.—During the week past gold has ranged from 114@114⅛ and closed at 114⅛.

Bullion.—Fine silver bar is quoted at $1 23@$1 24, gold, per ounce, and fine gold bar at par ($20 67 gold, per ounce,) to ¼ per cent. premium.

Copper.—The sales during the week have not aggregated over 300,000 lb. at 23⅞@23¾c. The latter is the asking price for both Lake and Baltimore, and the former is the price bid. All the copper shipped by Lake has arrived, but additional shipments will be made early by rail. No improvement in business is anticipated before the 15th of January, if even then. London quotes, to-day, Chili Bars at £80 10/.

Mr. MURRANT says of copper: "There has been an altogether unexampled sluggishness in this metal, and scarcely anyone will operate. At the Swansea ticketing on Tuesday last about 213 tons of ore (in fine) with an average produce of 19¾ per cent., brought an average price of 16/6 per unit. The other sales were 250 tons g.o.b., and named brands at £81 to £81 15/ for cash."

Tin.—This article is very quiet and not quite so strong as last week. The quotations in gold are as follows: Straits, 19½c.; L. and F., 19½c.; Refined, 19½c.; and Banca, 23⅛c. Straits in London was quoted, by cable, yesterday, at £82. To-day's cable simply says the market is better.

Mr. MURRANT says of tin: "Foreign has maintained the quotations of a week ago, sellers being scarce, except at top rates, and tin for forward delivery dearer than cash parcels. Whether any really serious fighting will take place through the outbreak at Perak, appears doubtful; but should such occur, prices may be expected to rise in proportion to the views of the matter taken by speculators here. The business reported was 100 tons Straits at 82/ 6d. to 83/ 6d., and 80 tons Australian at 81/ 7½d. to 82/ 6d. for cash and forward delivery. According to last advices the price of Straits was about £84 net laid down here, without commission on either side."

Tin Plates.—Advices from England denote much firmness there. In this market there is but little doing. The quotations per box, in gold, are as follows: charcoal tins, $7 50, and ternes, $7 25; coke tins, $6 50@6 75, and ternes, $6 25@6 37½.

Lead.—We are reported sales of about 250 tons of Domestic Ordinary at 5·90@5·95c., gold. The San Francisco *Journal of Commerce* of December 1, says:

"The Selby Refining Works at North Beach are again in full blast. Since our last monthly report the *Granada* and the *Belge* cleared for China and New York with 1578 bars bullion, and 200 rolls of lead, valued at $42,105 25, and the *Montana* took for New York 3121 bars of lead valued at $21,000, and 272 do. bullion valued at $5000."

Spelter and Zinc.—Domestic spelter is very quiet, and, as a rule, firm at 7.40c. currency, 30 days. Although sales are reported to have been made at lower figures, yet there appears to be none offering at less now. 70 tons of foreign are reported to have been sold on private terms. Silesian is quoted at 7·15@7·40c., gold. Sheet zinc is quiet at 9c., gold.

Antimony is quiet at 14c.

Quicksilver is quoted at 70c. per lb. in San Francisco; 80c. here, and £13 per flask in London.

The San Francisco *Commercial Herald* says: "A London cablegram of the 20th inst. gave the quotation at 11 guineas—say £14 11/. It is said that cable advices to Hongkong are interrupted. If so, the shipment to China by the steamer of the 1st proximo will, no doubt, be light. The present nominal price is 65c., with a small spot stock. London quotations of November 23d are £11, showing an unsettled market."

FINANCIAL.

New York Stocks.

FRIDAY, Dec. 10, 1875.

With but one or two unimportant exceptions, a material improvement has taken place in the quotations of New York Stocks. The sales for the week are nearly 5000 shares in excess of those of the previous week.

Bonds are fairly active at generally improved prices.

The following were sold at auction during the week at the prices annexed: $10,000 St. Louis & Iron Mt. RR., 1st mtg. bonds at 94; $5,000 C. & O. RR., coupons from November 1875 at 30; $12,500 Grand Tower Mining and Manufacturing Co. and Trans. Co., 1st mtg. bonds at $13 per bond, also $6000 of the 2d ditto at $11 per bond; 200 shares of the Erie Lead Co., $1 for the lot; 125 shares of the Mt. Carbon Coal & RR. Co., $100 each, $45 for the lot; 20 shares of the Oxford Iron Co., $100 each, $105 for the lot; and 200 shares of the Guyword Lead Co., $1 for the lot. The Board of Directors of the Union Mining Co., of Mt. Savage, Md., have declared a Dividend of five per cent, on the capital stock of the company, payable in New York on and after 3d January proximo, The New Jersey Zinc Company, whose mines are in Sussex Co., N. J., has made application to the Legislature to increase its capital stock to $500,000.

The Passaic Zinc Co. will hold its annual meeting for the election of Directors on the 4th of Jan. prox.

The coupons of the Joliet Iron & Steel Co., due Nov. 1st, are now being paid in New York.

The coupons of the Milwaukee Iron Co. are due, and payable in New York during the present month.

The bonds of the Chesapeake & Ohio RR. Co. remain firm at the improvement noted in our last, with light dealings.

The following is the plan for the purchase and reorganization of the Company, assented to by persons representing 1st mortgage bonds to the amount of nearly $6,000,000. It is proposed to purchase the property under a decree of sale obtained under both the six per cent. and seven per cent. mortgages. New securities will then be issued, as follows: First mortgage bonds, payable 30 years after date, with interest at six per cent. in gold, $17,000,000; second mortgage bonds, payable 40 years after date, with interest at six per cent., in currency, $10,000,000. It is provided that on $15,000,000 of the first mortgage bonds the interest for the first three years shall be paid in first preferred stock; in the fourth year, three per cent. in gold, and the fifth year, four per cent. in gold, the balance in each case being payable in first preferred stock; thereafter, the interest to be paid in full in gold. The second mortgage bonds to be payable for the first six years in second preferred stock; in the seventh year, two per cent. in currency and four per cent. in second preferred stock; in the eighth year, four per cent. in currency and two per cent. in second preferred stock; thereafter, in currency. The first preferred stock is to be entitled to dividends at the rate of seven per cent. per annum, and the second preferred stock at the rate of six per cent. The common stock to be issued to the amount of that now outstanding. Each holder of the present six per cent. first mortgage bonds is to receive ninety per cent. in the new first mortgage bonds, and ten per cent in the new second mortgage bonds. Each holder of the present seven per cent. mortgage bonds is to receive, in exchange therefor, 12½ per cent. in the new first mortgage bonds, 70 5-6 per cent. in the new second mortgage bonds, and 16 2-3 per cent. in the second preferred stock.

It is stated that the above plan does not increase the aggregate mortgage debt of the company beyond that now outstanding. It is probable that early action will betaken in this matter, pending the foreclosure proceedings which are now before the Court. The present liabilities of the company are as follows:

Mortgage bonds of the Virginia Central Railroad Company, secured on portions of the road between Richmond and Covington	$1,318,000
Past due and unpaid interest thereon, say	100,000
Other bonds of the Virginia Central Railroad Company secured by charter	187,578
Past due and unpaid interest thereon, say	23,000
Chesapeake and Ohio six per cent. first mortgage bonds, including those hypothecated as collateral to loans	15,000,000
Past due and unpaid interest thereon, to Nov. 1, 1875	2,250,000
Chesapeake and Ohio seven per cent. mortgage bonds outstanding, including those hypothecated as collateral to loans	12,131,000
Past due and unpaid interests thereon to July 1, 1875	1,698,340
Coupons falling due thereon January 1, 1876	424,585
Unsecured floating debt, about	2,000,000
Capital stock issued	15,900,000

The Union Pacific Railroad Company have declared a quarterly dividend of 2 per cent., payable January 1.

Quotations and Sales of Stocks and Bonds,

For the week ending Dec. 10, 1875.

STOCKS.

	Highest	Lowest	Closing	Shares sold.
Pennsylvania Coal Co	—	—	277½	30
Consolidation Coal Co	—	—	47	100
Spring Mt. Coal Co	—	—	60	10
American Coal Co	—	—	48	—
Maryland Coal Co	—	—	18	—
Del., Lack., and West. RR. Co	120¼	119⅝	120¼	3221
New Jersey Central RR. Co	105¼	105	105¼	1523
Delaware and Hudson Canal Co	123½	123¼	123½	195
Quicksilver Mining Co. pref'd	24¼	23	24¼	300
" " " Common	17½	17	17¼	600
Mariposa Land & Min. Co, various.	10½	8	9	6700
St. Louis & Iron Mountain RR	16¼	16	16¼	220
Lehigh & Wilkes-Barre Coal Co	—	—	40	—
Total Shares sold				12909
Sales for the week previous				8002
Increase				4907

BONDS.

	Sales.	Price
Ches. & O. R. R. 6s, 1st. cou. on	5,000	— @ 32
" " " ex coupon	10,000	— @ 26
Central RR. of N. J. 1st Mtg. N	15,000	114¼@115½
" " " 1st Cons	—	—@107¾
" " " Convt	3,000	—@105½
Del. and H. Canal, 1st Mtg. '77	2,000	—@103
" " 7s, '84	9,000	—@111
" " Reg. '91	—	—@112½
Del., Lack. & W. R. R., 7s, conv.	—	—@124
" " " " 2d Mtg.	—	—@†113½
St. Louis & Iron Mount'n 1st Mtg	—	— @ 93½
St. Louis & Iron M'tn, 2d Mtg.	—	— @ 56†
Lehigh & Wilkes-Barre Cons	10,000	‡96 @ 96¾
Total Sales	$54,000	

Closing quotations, in the absence of sales, represent the latest prices bid.

† Asked. ‡ Ex Interest.

Philadelphia Stocks.

PHILADELPHIA, Dec. 10, 1875.

The shares of the Pennsylvania Railroad Company are firm at slightly advanced figures, with sales of some 21,429 shares for the week. The Lehigh Valley Railroad stock, exhibits a slight advance with increased sales for the week, the balance of the list is without feature, the aggregate transactions for the week shows a decrease of nearly 8,000 shares compared with the business for the week previous.

Bonds are fairly active with the majority of quotations lower.

The following were sold at auction during the week at the prices annexed: $10,000 R. C. & I. Co., Deb. 7s coupons at 83⅓; $3,000 Colebr okdale Railroad, coupon 6s, guaranteed by the R. RR. Company at 81¼; $8,000 L. Nav. coupons 7s at 101⅛; $3,800 Connellsville Gas Coal Company, 1st mortgage coupons 6s at 50; and 160 shares of the Coal Ridge Imp'vt and Coal Company preferred at 25.

The Bearer Branch Coal Company held their annual meeting in Philadelphia, on the 8th instant.

The Camden and Atlantic Land Company announces a dividend of 25 per cent., payable at 402 Locust street

Quotations and Sales of Stocks and Bonds,

For the week ending Dec. 10, 1875.

STOCKS.

	Highest	Lowest	Closing	Shr's
Lehigh Valley RR. Co	62¾	62⅛	62⅝	776
Pennsylvania RR.	51¼	51	51¼	21429
Reading RR.	55¾	55⅜	55¾	4858
Lehigh Coal and Nav. Co	50¼	50	50¼	3584
Penn. Canal	—	—	9	—
Buck Mountain Coal Co.	—	—	—	—
Fulton Coal Co	—	—	3⅛	—
Locust Mountain Coal Co	—	—	—	—
Westmoreland Coal Co	—	—	80	—
St. Nicholas Coal Co	—	—	1	—
Cambria Iron Co	—	—	16	180
Crane Iron Co	—	—	46	—
Emaus Iron Co	—	—	—	—
Pennsylvania Salt Manufact. Co	75¾	75½	75½	64
Total shares sold				30,891
Sales for the week previous				38,541
Decrease				7,650

BONDS.

	Sales.	Price
H and B. T. RR. 1st mortgage, 7s	1,000	— @106¾
" " " 2d "	—	— @102½
" " " 3d " cons	—	— @ 55
Lehigh Valley RR. Con. mtg. 6s, Reg	12,000	— @ 97½
" " 7s, 1910	9,000	110¾@111
" " 6s reg	2 000	—@†103½
Pennsylvania RR., 1st mtge. 6s	1,000	— @105⅝
" " gen. " cou. 1910	4,000	— @102¾
" " gen. " 6s, reg	—	— @101¾
Phil. & Reading RR. 7s '93	1,000	— @108¾
" " " G. M. 7s, cou. 1911,	6,000	105⅛@105¾
" " " 7s, Reg	3,000	— @106
" " new convertible 7s	8,000	— @109⅜
Phil. & Reading C. & I. Co. 7s deb.	6,000	— @ 83⅜
" " " 6s Tam. Tract	—	— @ 90
" " Glenthworth Tract	5,000	— @ 90
Lehigh Coal & Nav. Co., 6s '84	6,000	— @103
" " " RR, '97	—	— @102⅝
" " " Con. m. 7s	2,000	— @102
" " " gold, '97	7,500	107 @108
Penn. Canal, 6s	—	— @ 70
Penn. and N. Y. Canal, 7s	4,000	— @107
Ches. and Del. Canal, 6s	—	— @ 88
Susquehanna Coal Co. 7s	—	— @ 70
Buck. Mount Coal Co. 6s	—	— @ 97½
Penn. Gas Coal Co. 6s	—	— @100¼
Total amount of sales	$77,500	

Closing quotations, in the absence of sales, represent the latest prices bid.

† Ex Interest.

Gold and Silver Stocks,

NEW YORK, Dec. 10, 1875.

Mining stocks are irregular with the tendency of the list towards lower prices. The feature of the report is an advance of $6 in the shares of the Caledonia Mining Company in face of an assessment of $3 per share, due the 4th inst. The Savage Mining Company has increased its capital stock to 112,000 shares, which is an increase of seven for one of the old issue. The new stock is quoted at $16 per share. This is equal to an advance of about 10 per cent. compared with our last quotation on the old basis. The Justice Mining Company, which is located on the Comstock Lode, has increased its capital stock to 105,000 shares. We quote the new stock at $34 per share. An assessment of $1 per share has been levied by this company, delinquent December 28.

The Poorman Mining Company, of Idaho, has levied an assessment of 50 cents per share, amounting to $25,000, delinquent on Dec. 29th.

The Pictou Mining Company have levied an assessment of 25 cents per share, delinquent December 26.

MINING NOTES.

Gen. F. J. MARSHALL, agent for the Kansas Pacific Railway, has forwarded 1947 tons of silver ore over that road to Eastern and European works during the present year up to November 21st. In the entire year of 1874, 1800 tons were shipped, valued at over $900,000.

The Stewart reducing works produced silver bricks during the year up to November 22, of a total coin value of $271,661.72, and those of JUDD & CROSBY gave $205,001.50 in bullion, making altogether $476,663.22.

The Marshall Silver Mining Company is working numerous lodes on Leavenworth Mountain. Its lodes have yielded over $200,000, most of which came out through the tunnels. Of the latter, the Marshall, now 1300 feet long and driven to develop lodes discovered by the company on the surface, discovered 800 feet from the tunnel mouth, one of the largest and best veins in Colorado. The Colorado central vein has yielded altogether $150,000, and gave a profit of $3,735.16 in October, from the labor of eight men.—*Central City Register.*

There are 22 stamp-mills with 500 stamps in operation in Gilpin County, Colorado, and they have turned out gold to the amount of $1,032,546.90 during the ten months ending November 1st, an excess over same time of any previous year.

The Napa *Register* says the product of the Pope Valley quicksilver mines has yielded, from the first to the present time, about $345,000 worth of quicksilver.

Up to the week ending Nov. 22d, 11,503 feet had been driven in the Sutro Tunnel. The details of the operations for the week ending the above date were as follows: Holes drilled. 259; holes blasted, 310; aggregate depth, 1860 feet; average depth, 78 feet; powder consumed, 863 lb.; exploders consumed, 310; drills sharpened, 1105; rock extracted, carloads, two tons each, 355. Rock very hard—quartzite—with occasional stringers of crystallized carbonate of lime.

QUOTATIONS:

	No. of shares.	Dec. 1.	Dec. 8.
Sierra Nevada	100,000	15	$17
Union Consolidated	100,000	9	8
Mexican	108,000	20	20
Ophir	128,000	52	51
California	540,000	70	67
Consolidated Virginia	108,000	366	362
Best & Belcher	100,800	59	54
Gould & Curry	108,000	21	19
Savage	112,000	97	16†
Hale and Norcross	16,000	41	36
Chollar Potosi	28,000	81	82
Alpha Consolidated	30,000	18	18
Imperial	100,000	8	8
Yellow Jacket	24,000	82	86
Kentuck	30,000	14	14
Crown Point	100,000	30	31
Belcher	104,000	27	33
Overman	38,400	53	51
Caledonia	20,000	17	23
Justice	105,000		34
Raymond & Ely	30,000	18	22
Meadow Valley	60,000	3	3
Eureka Consolidated	50,000	19	17
Eureka C. V.	22,000	6	6

† Increase of 7 shares for one.

Copper Stocks.

Specially reported by Messrs. WILSON W. FAY & CO., Bankers and Brokers, room 7 Traveller Building, 31 State street, Boston.

FRIDAY EVENING, Dec. 10.

Our usual report of the Boston Copper Stock Market has not come to hand in time for this issue. We note, however, a decline in Duncan Silver Mining Co.

Gas Stocks,

NEW YORK, Dec. 10, 1875.

The general tendency of gas stocks is towards lower prices, especially, is this the case with regard to the Brooklyn Companies, which, without exception, are lower. We understand that many of the stores in Brooklyn are substituting kerosene for gas, giving as their reason, that they get a better light at a far less expense. This, of course, affects stock; what effect it will have on the quality and price of gas remains to be seen. Sales for the week are reported to us as follows: 200 shares of the Citizens' of Brooklyn, at 145; 500 shares of the People's at par; 50 shares of the Metropolitan, at 105; and small transactions in Nassau, at 135; also 300 shares of the New York Gas Co.'s stock at 147@152½. We note the following sales at auction during the week at the prices annexed: 314 shares of the Manhattan Gas Co, at 309¾@311; 126 shares of the New York Gas Co., at 147@152½; 5 shares of the Metropolitan Gas Co., at 159; also $1,460 of the scrip of this company, in small lots, at from 103½@104½.

50 shares of the Northern Liberties Gas Co. were sold at auction, in Philadelphia, during the week, at 36½ per share.

265 shares of the People's Gas Co. of Baltimore, were sold in the Stock Market of that city, during the week ending the 9th instant, at from 27½@27¾.

The following list of Companies in New York and vicinity are corrected weekly by GEORGE H. PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad st., N. Y.

Quotations "bid" and "asked" of New York City and Vicinity Gas Companies are on the $100 of stock and not on one share.

Companies in New York and Vicinity.	Cap. Stk.	Par.	last Divid.	When Paid.	Bid.	Askd.
			pr.c			
Mutual, N. Y.	$5,000,000	$ 100	2½	Oct. '75	109¼	110
" " Bonds	900,00	1,000	†3½	Aug. "	104	105¼
NewYork, "	4,000,00c		5	Nov. "	149	151
Metropol. "	2,500,00c	100	5	Sept. "	157½	159
" " Certf.	1,000,000	...	3½	" "	104	105
" " Bonds	500,000	1,000	3½	July, "	105	
Harlem "	1.850,000	50	4	Aug. "	139	140
Manhattan "	4,000,000	50	5	July, "	309	311
Brooklyn, B'klyn.	2,000,00c	25	5	Nov. "	245	
Nassau "	1,000,00c	20	4	July, "	130	135
" " Certf.	700,000	1,000	3½	Nov. "	100	100½
People's "	1,000,c00	10	3½	July, "	99½	100
" " Certf.	300,000	1,000	3½	July, "	95	97½
" " Bds.	325,000	....	3½	Aug. "	100	101
Metropol. "	1,000,000	10	3½	May, "	102½	104½
Wmsburgh "	1,000,000	50	5	July, "	140	150
" " Certf.	1,000,000	....	3½	July, "	100	102
Citizen's "	1,200,000	20	2½	Oct. "	140	145
" " Certf.	320,000	1,000	3½	Oct. "	100	101
J. C. & Hob'n. N.J.	386,000	20	5	July, "	160	170
Westchest. Co. N.Y.	466,000	50	4	July, "	100	105

† Gold.

Companies out of Town.*	Cap. Stk.	Par	Bid	Askd.
People's " " of J. C.			130	
Citizen's G. L. Co., Newark, N.J.	500,000			65
Hempstead " " L. I., N.Y.	40,000	100		100
Jamaica, " " " "	25,000	100		100
Richmond Co., S. I. "	300,000		100	105
Citizens', Rochester, "		100	60	68
Rochester Gas Co., "		100	50	
People's G. L. Co. Albany, "	1,000,000	100		60
Mutual " Buffalo "	750,000	100	52	55
Troy G. L. Co., Troy, N. Y.			108	85
Brockport, N. Y., G. L. Co.	25,000	100		
Baltimore G. L. Co., Balt., Md.	2,000,000	100	108	
People's G. L. Co., Balt., Md	2,000,000	25	27¼	
Hannibal G. L. Co., Hanni., Mo.	100,000	100		60
La Clede, Mo				123
Lewiston G. L. Co., Lewis., Me	400,000	100		75
Chicago G. L. Co., Chicago, Ill.	2,000,000	100	140	
Jacksonville, Ill.	120,000	100	80	90
Lima, Ohio	60 000	100	10	
Derby G. L. Co., Derby, Conn.	160,000	100		80
Woonskt G. L. Co. Woonskt, R.I.	150,000	100	100	
Fort Wayne G. L. Co. F. W., Ind		100		105
North. Liberties G. L. Co. Phila.		25	36¼	
Wilkes-Barre G. L. Co W. B. Pa.		50	70	
Washington G. L. Co., Phila.			42	43
Pottsville, Pa., Gas Co.		50	40⅜	
Portland G. L. Co. Portland, Me	350,000	50	72	75
Hartford G. L. Co., Hartford, Ct	700,000	25	45	
Boston G. L. Co., Boston, Mass.	2,500,000	500	775	780
Chelsea G. L. Co. Chelsea, "	300,000		139	
Cambridge G. L. Co., Cam., "	700,000		132⅜	
Louisville G. L. Co., Louis., Ky.			127	
Cincinnati G. L. Co, Cincin, O.				200
S. F. G.L. Co. San Francisco, Cal	10,000,000	100	90	95
City G. L. Co. Montreal, Canada	1,440,000	40	129	130½
Consumers G. L. (old.) Tor., Ont	600,000	50	130	132
Halifax G. L. Co., Halifax, N.S.		40	147	150

* These quotations represent the latest obtainable prices at which sales were made.

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Exclusively for the Analysis of Ores of Iron, Pig and Manufactured Iron, Steels, Limestone, Clays, Slags and Coal for Practical Metallurgical Purposes.

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For each additional constituent of usual occurrence	1 50
For those of unusual occurrence or difficult to determine, the charge must necessarily depend upon circumstances.	
For determining the per cent. of Sulphur and Phosphorus in Iron or Steel	14 00
For each additional constituent of usual occurrence	6 00
For the per cent. of Carbonate of Lime, and insoluble Silicious Matter in a Limestone	10 00
For each additional constituent	2 00
For the per cent. of Water, Volatile Combustible Matter, fixed Carbon, and Ash in Coal	12 50
For determining the constituents of a Clay, Slag, Coke, or of an Ash of Coal, the charges will correspond with those for the constituents of an ore.	
For a written opinion or letter of instruction the charge must necessarily depend upon circumstances.	
Printed instructions for obtaining proper average samples for analysis furnished upon application.	

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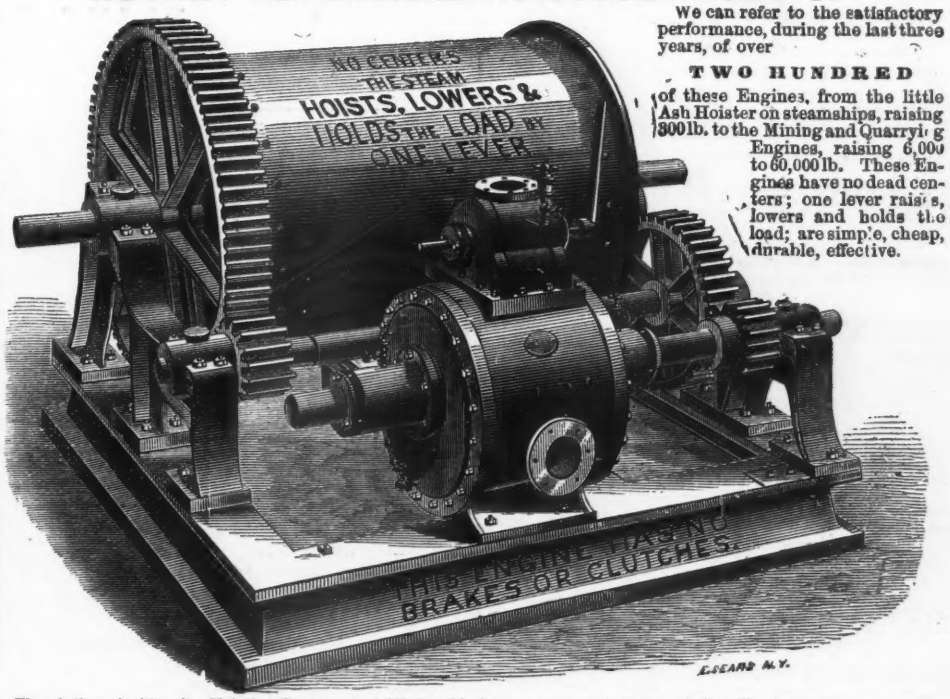

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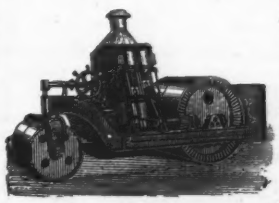

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Office of the CHICAGO SILVER MINING CO.,
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The line, as you are aware, is constructed over an extremely rugged country, one and one quarter miles in length.

For the first half mile or so, it is down a very steep mountain side, whence it passes over the brow of another one; thence it continues down Dry Canyon at an angle of fifteen to eighteen degrees.

The structure is an entire success, the cost entire of which has more than been saved already, although it has not been worked up to half its capacity.

In the estimate of earnings no account was taken of supplies sent to the mine, including water, etc., by no means an inconsiderable item. Truly yours, W. S. GODBE,
Manager Chicago S. M. Co. (limited.)

Supt. Office EMMA HILL CONSOLIDATED M. Co.,
LITTLE COTTONWOOD, Utah, Dec. 17, 1874.

A. S. HALLIDIE, Esq.: Dear Sir—In answer to your inquiry, I have to report that the Ropeway (built August, 1872), continues to work splendidly, and with but little wear on the rope. It has been everything that was promised, and has proved to be the cheapest way to move ores on steep mountain sides.

Yours very truly, L. U. COLBATH, Sup't.

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made expressly for the use of Steam Fire-Engines, and will stand a pressure of 400 pounds per square inch. Officers of Fire Departments requiring New Hose will find this much superior in strength and quality to any other.

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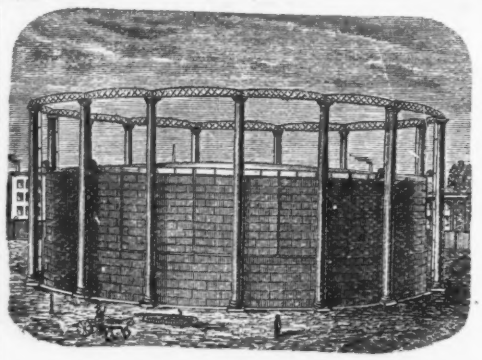

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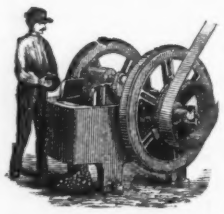

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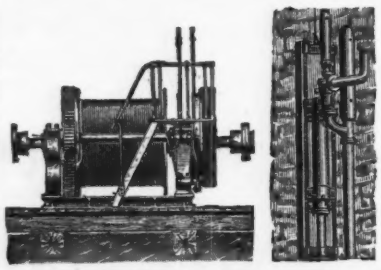

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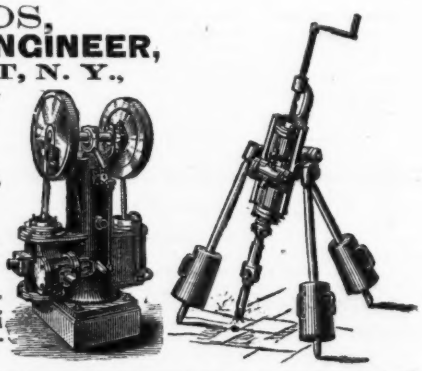

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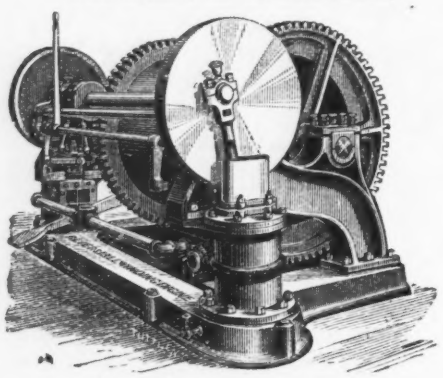

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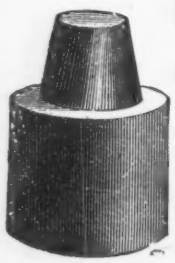

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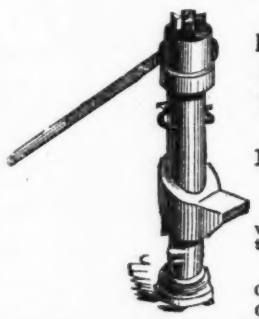

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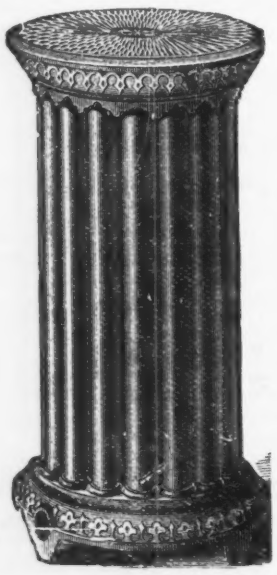

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